



**BUDAPESTI MŰSZAKI ÉS GAZDASÁGTUDOMÁNYI EGYETEM**  
**Vegyésmérnöki és Biomérnöki Kar**  
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**FOSZFINSAV-ÉSZTEREK ÉS AMIDOK SZINTÉZISE;**

**KÖRNYEZETBARÁT MEGOLDÁSOK**

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**DOKTORI ÉRTEKEZÉS**

**ELEKTRONIKUS MELLÉKLET**

**AZ ELŐÁLLÍTOTT VEGYÜLETEK JELLEMZÉSE**

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**SZERVES KÉMIA ÉS TECHNOLÓGIA TANSZÉK**

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**1. TELÍTETT GYŰRŰS FOSZFINSAVAK (9, 10 és 13)****1-Hidroxi-3-metilfoszfolán-1-oxid (9) [9]**<sup>74</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 80,2 (bs); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 21,5 (d, *J* = 14,8, CH<sub>3</sub>), 27,0 (d, *J* = 88,0, PCH<sub>2</sub>), 31,7 (d, *J* = 7,9, CH<sub>2</sub>), 32,4 (d, *J* = 11,8, CH), 34,3 (d, *J* = 91,4, PCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 135,0578, C<sub>5</sub>H<sub>12</sub>O<sub>2</sub>P-re számított: = 135,0575.

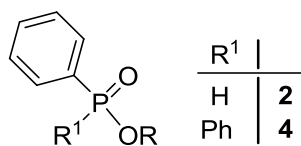
**1-Hidroxi-3,4-dimetilfoszfolán-1-oxid (10) [10]**<sup>74</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 72,9 (bs), [70%], 79,5 (bs), [30%]; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre: 19,0 (*J* = 18,2, CH<sub>3</sub>), 35,1 (*J* = 90,0, C<sub>2</sub>), 38,9 (*J* = 10,9, C<sub>3</sub>), a minor izomerre: 15,9 (*J* = 9,4, CH<sub>3</sub>), 33,1 (*J* = 89,3, C<sub>2</sub>), 35,6 (*J* = 11,5, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,00 (d, *J* = 6,5, CH<sub>3</sub> (minor izomer)), 1,08 (d, *J* = 5,04, CH<sub>3</sub> (major izomer)), total intenzitás 3H, 1,39–2,29 (m, 6H, CH<sub>2</sub>, CH), 9,00 (bs, 1H, OH); [M+H]<sup>+</sup><sub>mért</sub> = 149,0731, C<sub>6</sub>H<sub>14</sub>O<sub>2</sub>P-re számított: = 149,0653.

**1-Hidroxi-1,2,3,4,5,6-hexahidrofoszfinin-1-oxid (13) [19]**<sup>74</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 51,8; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 22,8 (*J* = 4,3, CH<sub>3</sub>), 24,5 (*J* = 16,6, C<sub>3</sub>), 27,4 (*J* = 89,7, C<sub>6</sub>), 31,3 (*J* = 4,0, C<sub>4</sub>)\*, 35,2 (*J* = 6,3, C<sub>5</sub>)\*, 36,6 (*J* = 85,5, C<sub>2</sub>); \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,04 (s, 3H, CH<sub>3</sub>), 1,30–2,17 (m, 9H, CH<sub>2</sub>, CH), 10,32 (bs, OH); [M+H]<sup>+</sup><sub>mért</sub> = 149,0732, C<sub>6</sub>H<sub>14</sub>O<sub>2</sub>P-re számított: = 149,0731.

## 2. FENILFOSZFINÁTOK (2 és 4)

Etil-*H*-fenilfoszfinát<sup>96</sup> (2a) [7e]<sup>186</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 24,7, <sup>1</sup>J<sub>P,H</sub> = 563,0, (δ lit<sup>96</sup> 25,7, <sup>1</sup>J<sub>P,H</sub> = 562,0); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 16,2 (<sup>3</sup>J = 6,5, CH<sub>2</sub>CH<sub>3</sub>), 61,9 (<sup>2</sup>J = 6,3, OCH<sub>2</sub>), 128,6 (<sup>3</sup>J = 13,9, C<sub>3'</sub>)\*, 129,7 (<sup>1</sup>J = 132,2, C<sub>1'</sub>), 130,7 (<sup>2</sup>J = 11,8, C<sub>2'</sub>)\*, 133,0 (<sup>4</sup>J = 2,9, C<sub>4'</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,39 (t, J = 7,0, 3H, CH<sub>2</sub>CH<sub>3</sub>), 4,11–4,24 (m, 2H, OCH<sub>2</sub>), 7,60 (d, J = 562,5, 1H, PH), 7,52–7,83 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 171,0569, C<sub>8</sub>H<sub>11</sub>O<sub>2</sub>P-re számított: 171,0575.

*n*-Propil-*H*-fenilfoszfinát (2b) [7c]<sup>186</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 24,9, <sup>1</sup>J<sub>P,H</sub> = 562,9; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 10,1 (CH<sub>3</sub>), 23,6 (<sup>3</sup>J = 6,5, CH<sub>2</sub>CH<sub>2</sub>), 67,3 (<sup>2</sup>J = 6,6, OCH<sub>2</sub>), 128,5 (<sup>3</sup>J = 13,8, C<sub>3'</sub>)\*, 129,8 (<sup>1</sup>J = 132,0, C<sub>1'</sub>), 130,7 (<sup>2</sup>J = 11,8, C<sub>2'</sub>)\*, 133,0 (<sup>4</sup>J = 2,9, C<sub>4'</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,98 (t, J = 7,4, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,74–1,81 (m, 2H CH<sub>2</sub>CH<sub>3</sub>), 4,01–4,09 (m, 2H, OCH<sub>2</sub>), 7,59 (d, J = 562,5, 1H, PH), 7,50–7,82 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 185,0725, C<sub>9</sub>H<sub>13</sub>O<sub>2</sub>P-re számított: 185,0731.

*i*-Propil-*H*-fenilfoszfinát<sup>221</sup> (2c) [7d]<sup>186</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 22,3, <sup>1</sup>J<sub>P,H</sub> = 559,0, (δ lit<sup>221</sup> 23,4); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 23,7 (J = 4,1, CH(CH<sub>3</sub>)), 24,1 (J = 4,6, CH(CH<sub>3</sub>)) 71,2 (J = 6,5, CH(CH<sub>3</sub>)<sub>2</sub>), 128,5 (<sup>3</sup>J = 13,8, C<sub>3'</sub>), 130,3 (<sup>1</sup>J = 133,4, C<sub>1'</sub>), 130,7 (<sup>2</sup>J = 11,8, C<sub>2'</sub>), 132,8 (<sup>4</sup>J = 2,9, C<sub>4'</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,35 (d, J = 6,0, 3H, CH<sub>3</sub>), 1,43 (d, J = 6,0, 3H, CH<sub>3</sub>) 4,66–4,79 (m, 1H OCH), 7,62 (d, J = 559,2, 1H, PH), 7,51–7,83 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 185,0726, C<sub>9</sub>H<sub>13</sub>O<sub>2</sub>P-re számított: 185,0731.

*n*-Butil-*H*-fenilfoszfinát<sup>96</sup> (**2d**) [**7a**]<sup>186</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 24,9, <sup>1</sup>J<sub>P,H</sub> = 566,7, (δ lit<sup>96</sup> 25,3, <sup>1</sup>J<sub>P,H</sub> = 563); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,2 (CH<sub>2</sub>CH<sub>3</sub>), 18,4 (CH<sub>2</sub>CH<sub>3</sub>), 32,1 (<sup>3</sup>J = 6,4, OCH<sub>2</sub>CH<sub>2</sub>), 65,4 (<sup>2</sup>J = 6,6, OCH<sub>2</sub>), 128,4 (<sup>3</sup>J = 13,8, C<sub>3'</sub>)\*, 129,6 (<sup>1</sup>J = 131,9, C<sub>1</sub>), 130,5 (<sup>2</sup>J = 11,7, C<sub>2'</sub>)\*, 132,7 (<sup>4</sup>J = 2,6, C<sub>4'</sub>) \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,95 (t, J = 7,3, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,39–1,51 (m, 2H CH<sub>2</sub>CH<sub>3</sub>), 1,68–1,78 (m, 2H, OCH<sub>2</sub>CH<sub>2</sub>), 4,06–4,15 (m, 2H, OCH<sub>2</sub>), 7,6 (d, J = 562,3, 1H, P–H), 7,54–7,84 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 199,0881, C<sub>10</sub>H<sub>15</sub>O<sub>2</sub>P-re számított: 199,0888.

*i*-Butil-*H*-fenilfoszfinát (**2e**) [**7b**]<sup>186</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 25,0, <sup>1</sup>J<sub>P,H</sub> = 562,3; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 18,4 (CH(CH<sub>3</sub>)<sub>2</sub>) 28,8 (<sup>3</sup>J = 6,6, CH(CH<sub>3</sub>)<sub>2</sub>), 71,4 (<sup>2</sup>J = 6,8, OCH<sub>2</sub>), 128,3 (<sup>3</sup>J = 13,8, C<sub>3'</sub>), 128,7 (<sup>1</sup>J = 132,6, C<sub>1'</sub>), 130,5 (<sup>2</sup>J = 11,7, C<sub>2'</sub>), 132,7 (<sup>4</sup>J = 2,8, C<sub>4'</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,97 (d, J = 6,6, 6H, CH(CH<sub>3</sub>)<sub>2</sub>), 1,90–2,08 (m, 1H, OCH<sub>2</sub>CH), 3,79–3,92 (m, 2H, OCH<sub>2</sub>), 7,59 (d, J = 562,6, 1H, PH), 7,52–7,83 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 199,0881, C<sub>10</sub>H<sub>15</sub>O<sub>2</sub>P-re számított: 199,0888.

*n*-Pentil-*H*-fenilfoszfinát (**2f**) [**2b**]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 25,7, <sup>1</sup>J<sub>P,H</sub> = 563,4; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,9 (CH<sub>3</sub>), 22,2 (CH<sub>2</sub>CH<sub>3</sub>), 27,6 (CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>), 30,1 (<sup>3</sup>J = 6,4, OCH<sub>2</sub>CH<sub>2</sub>), 66,0 (<sup>2</sup>J = 6,6, OCH<sub>2</sub>), 128,7 (<sup>3</sup>J = 13,8, C<sub>3'</sub>)\*, 130,0 (<sup>1</sup>J = 132,0, C<sub>1'</sub>), 130,9 (<sup>2</sup>J = 5,9, C<sub>2'</sub>)\*, 133,0 (<sup>4</sup>J = 2,9, C<sub>4'</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,89 (t, J = 7,1, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,25–1,42 (m, 4H, 2×CH<sub>2</sub>), 1,60–1,78 (m, 2H, CH<sub>2</sub>), 3,94–4,16 (m, 2H, OCH<sub>2</sub>), 7,58 (d, J = 562,6, 1H, PH), 7,35–7,65 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 213,1037, C<sub>11</sub>H<sub>18</sub>O<sub>2</sub>P-re számított: 213,1044.

*i*-Pentil-*H*-fenilfoszfinát (**2g**) [**2c**]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 25,7, <sup>1</sup>J<sub>P,H</sub> = 562,0; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 22,3 (CHCH<sub>3</sub>), 24,5 (CH), 39,1 (<sup>3</sup>J = 6,4, OCH<sub>2</sub>CH<sub>2</sub>), 64,4 (<sup>2</sup>J = 6,6, OCH<sub>2</sub>), 128,7 (<sup>3</sup>J = 13,8, C<sub>3'</sub>)\*, 129,9 (<sup>1</sup>J = 132,0, C<sub>1'</sub>),

130,8 ( $^2J = 11,8$ ,  $C_{2'}$ )\*, 133,0 ( $^4J = 3,0$ ,  $C_{4'}$ ), \*felcserélhető;  $^1H$  NMR ( $CDCl_3$ )  $\delta$  0,89 (t,  $J = 6,5$ , 6H,  $CHCH_3$ ), 1,54–1,64 (m, 2H,  $CH_2$ ), 1,64–1,81 (m, 1H, CH), 4,02–4,16 (m, 2H,  $OCH_2$ ), 7,56 (d,  $J = 562,1$ , 1H, PH), 7,45–7,82 (m, 5H, Ar);  $[M+H]^+_{mért} = 213,1042$ ,  $C_{11}H_{18}O_2P$ -re számított: 213,1044.

*n*-Oktil-*H*-fenilfoszfinát (2h) [2d]<sup>187</sup>

$^{31}P$  NMR ( $CDCl_3$ )  $\delta$  25,0,  $^1J_{P,H} = 562,5$ ;  $^{13}C$  NMR ( $CDCl_3$ )  $\delta$  14,0 ( $CH_2CH_3$ ), 22,6 ( $CH_2CH_3$ ), 25,5 ( $CH_2$ ), 29,0 ( $CH_2$ ), 29,1 ( $CH_2$ ), 30,4 ( $^3J = 6,4$ ,  $OCH_2CH_2$ ), 31,7 ( $CH_2$ ), 66,0 ( $^2J = 6,6$ ,  $OCH_2$ ), 128,7 ( $^3J = 13,8$ ,  $C_{3'}$ )\*, 130,0 ( $^1J = 132,2$ ,  $C_{1'}$ ), 130,9 ( $^2J = 11,8$ ,  $C_{2'}$ )\*, 133,0 ( $^4J = 2,8$ ,  $C_{4'}$ ), \*felcserélhető;  $^1H$  NMR ( $CDCl_3$ )  $\delta$  0,86 (t,  $J = 6,7$ , 3H,  $CH_3$ ), 1,18–1,44 (m, 10H,  $5 \times CH_2$ ), 1,61–1,77 (m, 2H,  $CH_2$ ), 3,97–4,15 (m, 2H,  $OCH_2$ ), 7,57 (d,  $J = 562,5$ , 1H, PH), 7,42–7,83 (m, 5H, Ar);  $[M+H]^+_{mért} = 255,1517$ ,  $C_{14}H_{24}O_2P$ -re számított: 255,1514.

2-Etilhexil-*H*-fenilfoszfinát (2i) [2e]<sup>187</sup>

$^{31}P$  NMR ( $CDCl_3$ )  $\delta$  25,2,  $^1J_{P,H} = 562,0$ ;  $^{13}C$  NMR ( $CDCl_3$ )  $\delta$  10,7 ( $CH_3$ ), 13,9 ( $CH_3$ ), 22,8 ( $CH_2$ ), 23,2 ( $CH_2$ ), 28,7 ( $J = 3,5$ ,  $CH_2$ ), 29,8 ( $CH_2$ ), 40,1 ( $^3J = 6,8$ ,  $OCH_2CH$ ), 67,7 ( $^2J = 6,7$ ,  $OCH_2$ ) és 67,8 ( $^2J = 6,8$ ,  $OCH_2$ ), 128,6 ( $^3J = 13,8$ ,  $C_{3'}$ )\*, 129,9 ( $^1J = 134,6$ ,  $C_{1'}$ ), 130,7 ( $^2J = 11,7$ ,  $C_{2'}$ )\*, 132,9 ( $^4J = 2,9$ ,  $C_{4'}$ ), \*felcserélhető;  $^1H$  NMR ( $CDCl_3$ )  $\delta$  0,88 (t,  $J = 7,4$ , 3H,  $CH_3$ ), 0,89 (t,  $J = 7,3$ , 3H,  $CH_3$ ), 1,17–1,46 (m, 8H,  $4 \times CH_2$ ), 1,56–1,67 (m, 1H, CH), 3,90–4,06 (m, 2H,  $OCH_2$ ), 7,58 (d,  $J = 561,9$ , 1H, PH), 7,42–7,86 (m, 5H, Ar);  $[M+H]^+_{mért} = 255,1516$ ,  $C_{14}H_{24}O_2P$ -re számított: 255,1514.

*n*-Butil-difenilfoszfinát<sup>222</sup> (4a) [9]<sup>186</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 31,2; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,6 (CH<sub>3</sub>), 18,9 (CH<sub>2</sub>CH<sub>3</sub>), 32,6 (<sup>3</sup>J = 6,6, OCH<sub>2</sub>CH<sub>2</sub>), 64,7 (<sup>2</sup>J = 6,1, OCH<sub>2</sub>), 128,5 (<sup>3</sup>J = 13,1, C<sub>3'</sub>)\*, 129,7 (<sup>1</sup>J = 144,6, C<sub>1'</sub>), 131,7 (<sup>2</sup>J = 10,0, C<sub>2'</sub>)\*, 132,0 (<sup>4</sup>J = 2,8, C<sub>4'</sub>) \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,92 (t, J = 7,3, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,35–1,48 (m, 2H CH<sub>2</sub>CH<sub>3</sub>), 1,68–1,74 (m, 2H, OCH<sub>2</sub>CH<sub>2</sub>), 3,99–4,07 (m, 2H OCH<sub>2</sub>), 7,44–7,55 (m, Ar), 7,78–7,85 (m, Ar, Totál intenzitás = 10H); [δ lit<sup>222</sup> 0,85 (t, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,4 (m, 4H, CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>), 3,9 (m, 2H OCH<sub>2</sub>), 7,5 (m, 10H, Ar)]; [M+H]<sup>+</sup><sub>mért</sub> = 275,1193, a C<sub>16</sub>H<sub>19</sub>O<sub>2</sub>P-re számított: 275,1201.

*n*-Pentil-difenilfoszfinát<sup>223</sup> (4b)

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 31,2, (δ lit<sup>223</sup> 30,0); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,9 (CH<sub>3</sub>), 22,2 (CH<sub>2</sub>CH<sub>3</sub>), 27,7 (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>), 30,3 (<sup>3</sup>J = 6,6, OCH<sub>2</sub>CH<sub>2</sub>), 65,0 (<sup>2</sup>J = 6,1, OCH<sub>2</sub>), 128,5 (<sup>3</sup>J = 13,1, C<sub>3'</sub>)\*, 131,6 (<sup>2</sup>J = 10,1, C<sub>2'</sub>)\*, 131,7 (<sup>1</sup>J = 137,1, C<sub>1'</sub>), 132,0 (<sup>4</sup>J = 2,8, C<sub>4'</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,89 (t, J = 7,0, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,24–1,43 (m, 4H, 2xCH<sub>2</sub>), 1,66–1,78 (m, 2H, OCH<sub>2</sub>CH<sub>2</sub>), 3,97–4,08 (m, 2H, OCH<sub>2</sub>), 7,38–7,57 (m, Ar), 7,75–7,88 (m, Ar), teljes intenzitás 10H; [M+H]<sup>+</sup><sub>mért</sub> = 289,1358, C<sub>17</sub>H<sub>22</sub>O<sub>2</sub>P-re számított: 289,1357.

*i*-Pentil-difenilfoszfinát<sup>224</sup> (4c)

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 30,1, (δ lit<sup>224</sup> 31,3); [M+H]<sup>+</sup><sub>mért</sub> = 289,1359, C<sub>17</sub>H<sub>22</sub>O<sub>2</sub>P-re számított: 289,1357.

*n*-Oktil-difenilfoszfinát (4d)

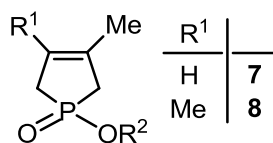
<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 31,2; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,1 (CH<sub>3</sub>), 22,6 (CH<sub>2</sub>), 25,6 (CH<sub>2</sub>), 29,08 (CH<sub>2</sub>), 29,12 (CH<sub>2</sub>), 30,5 (<sup>3</sup>J = 6,6, OCH<sub>2</sub>CH<sub>2</sub>), 31,7 (CH<sub>2</sub>), 65,0 (<sup>2</sup>J = 6,0, OCH<sub>2</sub>), 128,5 (<sup>3</sup>J = 13,1, C<sub>3'</sub>)\*, 131,6 (<sup>2</sup>J = 10,1, C<sub>2'</sub>)\*, 131,7 (<sup>1</sup>J = 137,1, C<sub>1'</sub>), 132,0 (<sup>4</sup>J = 2,8, C<sub>4'</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,87 (t, J = 6,8, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,20–1,42 (m, 10H, 5xCH<sub>2</sub>), 1,52–1,80 (m, 2H, OCH<sub>2</sub>CH<sub>2</sub>), 3,97–4,08 (m, 2H, OCH<sub>2</sub>), 7,40–7,56 (m, Ar), 7,75–

7,87 (m, Ar), teljes intenzitás 10H;  $[M+H]^+_{\text{mért}} = 331,1825$ ,  $C_{20}H_{28}O_2P$ -re számított: 331,1827.

2-Etilhexil-difenilfoszfinát (4e)

$^{31}P$  NMR ( $CDCl_3$ )  $\delta$  31,0;  $^{13}C$  NMR ( $CDCl_3$ )  $\delta$  10,9 ( $CH_3$ ), 14,0 ( $CH_3$ ), 22,9 ( $CH_2$ ), 23,4 ( $CH_2$ ), 28,8 ( $CH_2$ ), 30,0 ( $CH_2$ ), 40,2 ( $^3J = 7,0$ ,  $OCH_2CH$ ), 66,7 ( $^2J = 5,4$ ,  $OCH_2$ ), 128,4 ( $^3J = 13,1$ ,  $C_3$ )\*, 131,6 ( $^2J = 10,0$ ,  $C_2$ )\*, 131,7 ( $^1J = 137,0$ ,  $C_1$ ), 132,0 ( $^4J = 2,8$ ,  $C_4$ ), \*felcserélhető;  $^1H$  NMR ( $CDCl_3$ )  $\delta$  0,86 (t,  $J = 7,2$ , 6H,  $2 \times CH_3$ ), 1,24–1,46 (m, 9H,  $4 \times CH_2$ , CH), 3,90–4,94 (m, 2H,  $OCH_2$ ), 7,26–7,52 (m, Ar), 7,77–7,84 (m, Ar), teljes intenzitás 10H;  $[M+H]^+_{\text{mért}} = 331,1824$   $C_{20}H_{28}O_2P$ -re számított: 331,1827.



**3. 1-ALKIL-3-METIL-3-FOSZFOLÉN-1-OXIDOK (7 és 8)****1-*n*-Butoxi-3-metil-3-foszfolén-1-oxid (7b) [4]<sup>186</sup>**

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 74,6; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,7 (CH<sub>2</sub>CH<sub>3</sub>), 18,9 (CH<sub>2</sub>CH<sub>3</sub>), 20,9 (<sup>3</sup>J = 12,9, C<sub>3</sub>-CH<sub>3</sub>), 30,9 (<sup>1</sup>J = 88,2, C<sub>2</sub>), 32,7 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 33,6 (<sup>1</sup>J = 92,3, C<sub>5</sub>), 64,7 (<sup>2</sup>J = 6,8, OCH<sub>2</sub>), 120,4 (<sup>2</sup>J = 10,8, C<sub>4</sub>), 136,4 (<sup>2</sup>J = 16,8, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,94 (t, J = 7,4, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,38–1,43 (m, 2H, CH<sub>2</sub>CH<sub>3</sub>), 1,64–1,69 (m, 2H, OCH<sub>2</sub>CH<sub>2</sub>), 1,80 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,39–2,52 (m, 4H, PCH<sub>2</sub>), 4,01–4,06 (m, 2H, OCH<sub>2</sub>), 5,52 (d, J = 35,9, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 189,1038, C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>P-re számított: 189,1044.

**1-*n*-Pentoxi-3-metil-3-foszfolén-1-oxid (7d) [3a]<sup>188</sup>**

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 75,4; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,8 (CH<sub>2</sub>CH<sub>3</sub>), 20,6 (<sup>3</sup>J = 12,9, C<sub>3</sub>-CH<sub>3</sub>), 22,1 (CH<sub>2</sub>), 27,5 (CH<sub>2</sub>), 30,2 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 30,6 (<sup>1</sup>J = 90,2, C<sub>2</sub>), 33,3 (<sup>1</sup>J = 92,2, C<sub>5</sub>), 64,7 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 120,2 (<sup>2</sup>J = 10,8, C<sub>4</sub>), 136,2 (<sup>2</sup>J = 16,9, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,85 (t, J = 6,9, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,21–1,34 (m, 4H, 2×CH<sub>2</sub>), 1,57–1,70 (m, 2H, OCH<sub>2</sub>CH<sub>2</sub>), 1,74 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,18–2,50 (m, 4H, PCH<sub>2</sub>), 3,89–4,03 (m, 2H, OCH<sub>2</sub>), 5,47 (d, J = 35,9, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 203,1204, C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>P-re számított: 203,1201.

**1-(3-Pentoxi)-3-metil-3-foszfolén-1-oxid<sup>91</sup> (7e)**

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 73,5, (δ lit<sup>91</sup> 73,6); [M+H]<sup>+</sup><sub>mért</sub> = 203,1201, C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>P-re számított: 203,1201.

1-(3-Metilbutoxi)-3-metil-3-foszfolén-1-oxid (7f) [3b]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 74,7; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 20,7 (<sup>3</sup>J = 12,9, C<sub>3</sub>-CH<sub>3</sub>), 22,3 (2×CH<sub>3</sub>), 24,6 (CH), 30,7 (<sup>1</sup>J = 88,2, C<sub>2</sub>), 33,4 (<sup>1</sup>J = 92,2, C<sub>5</sub>), 39,3 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 63,3 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 120,3 (<sup>2</sup>J = 10,8, C<sub>4</sub>), 136,3 (<sup>2</sup>J = 16,8, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,90 (d, J = 6,6, 6H, CH(CH<sub>3</sub>)<sub>2</sub>), 1,51–1,61 (m, 2H, OCH<sub>2</sub>CH<sub>2</sub>), 1,62–1,74 (m, 1H, CH(Me)<sub>2</sub>), 1,78 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,23–2,51 (m, 4H, PCH<sub>2</sub>), 3,99–4,09 (m, 2H, OCH<sub>2</sub>), 5,50 (d, J = 35,8, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 203,1203, C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>P-re számított: 203,1203.

1-n-Oktiloxi-3-metil-3-foszfolén-1-oxid (7g) [4b]<sup>189</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 74,6; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 20,7 (<sup>3</sup>J = 13,0, C<sub>3</sub>-CH<sub>3</sub>), 22,6 (CH<sub>2</sub>), 25,5 (CH<sub>2</sub>), 29,1 (2×CH<sub>2</sub>), 30,6 (<sup>3</sup>J = 5,8, OCH<sub>2</sub>CH<sub>2</sub>), 30,7 (<sup>1</sup>J = 87,9, C<sub>2</sub>)\*, 31,7 (CH<sub>2</sub>), 33,4 (<sup>1</sup>J = 90,7, C<sub>5</sub>)\*, 64,9 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 120,3 (<sup>2</sup>J = 10,8, C<sub>4</sub>), 136,2 (<sup>2</sup>J = 16,9, C<sub>3</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,85 (t, J = 6,9, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,25–1,36 (m, 10H, CH<sub>2</sub>), 1,61–1,70 (m, 2H, CH<sub>2</sub>), 1,77 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,31–2,46 (m, 4H, PCH<sub>2</sub>), 3,96–4,03 (m, 2H, OCH<sub>2</sub>), 5,50 (d, J = 35,9, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 245,1671, C<sub>13</sub>H<sub>26</sub>O<sub>2</sub>P-re számított: 245,1670.

1-(2-Etilhexiloxi)-3-metil-3-foszfolén-1-oxid (7h) [3c]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 74,6; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 10,8 (CHCH<sub>3</sub>), 13,9 (CHCH<sub>3</sub>), 20,7 (<sup>3</sup>J = 12,9, C<sub>3</sub>-CH<sub>3</sub>), 22,9 (CH<sub>2</sub>), 23,2 (CH<sub>2</sub>), 28,8 (CH<sub>2</sub>), 29,8 (CH<sub>2</sub>), 30,6 (<sup>1</sup>J = 88,3, C<sub>2</sub>), 33,3 (<sup>1</sup>J = 92,2, C<sub>5</sub>), 40,1 (<sup>3</sup>J = 6,4, OCH<sub>2</sub>CH), 66,9 (<sup>2</sup>J = 7,0, OCH<sub>2</sub>), 120,3 (<sup>2</sup>J = 10,8, C<sub>4</sub>), 136,2 (<sup>2</sup>J = 16,9, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,87 (t, J = 7,3, 6H, CH<sub>2</sub>CH<sub>3</sub>), 1,18–1,44 (m, 8H, 4×CH<sub>2</sub>), 1,47–1,62 (m, 1H, OCH<sub>2</sub>CH), 1,78 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,23–2,51 (m, 4H, PCH<sub>2</sub>), 2,84–2,97 (m, 2H, OCH<sub>2</sub>), 5,51 (d, J = 35,8, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 245,1670, C<sub>13</sub>H<sub>26</sub>O<sub>2</sub>P-re számított: 245,1670.

1-*n*-Dodeciloxi-3-metil-3-foszfólen-1-oxid (7i) [4a]<sup>189</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 74,8; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 20,7 (<sup>3</sup>J = 12,9, C<sub>3</sub>–CH<sub>3</sub>), 22,6 (CH<sub>2</sub>), 25,5 (CH<sub>2</sub>), 29,1 (CH<sub>2</sub>), 29,3 (CH<sub>2</sub>), 29,4 (CH<sub>2</sub>), 29,47 (CH<sub>2</sub>), 29,54 (2×CH<sub>2</sub>), 30,5 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 30,7 (<sup>1</sup>J = 88,3, C<sub>2</sub>)\*, 31,8 (CH<sub>2</sub>), 33,4 (<sup>1</sup>J = 92,2, C<sub>5</sub>)\*, 64,9 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 120,3 (<sup>2</sup>J = 10,8, C<sub>4</sub>), 136,2 (<sup>2</sup>J = 16,8, C<sub>3</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,86 (t, J = 7,0, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,22–1,31 (m, 18H, CH<sub>2</sub>), 1,61–1,72 (m, 2H, CH<sub>2</sub>), 1,78 (s, 3H, C<sub>3</sub>–CH<sub>3</sub>), 2,24–2,51 (m, 4H, PCH<sub>2</sub>), 3,96–4,05 (m, 2H, OCH<sub>2</sub>), 5,51 (d, J = 35,8, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 301,2298, C<sub>17</sub>H<sub>34</sub>O<sub>2</sub>P-re számított: 301,2296.

1-Metoxi-3-metil-3-foszfólen-1-oxid<sup>225</sup> (7j)

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 76,9, (δ lit<sup>225</sup> 77,0); [M+H]<sup>+</sup><sub>mért</sub> = 147,0575, C<sub>6</sub>H<sub>12</sub>O<sub>2</sub>P-re számított: 147,0575.

1-Benziloxi-3-metil-3-foszfólen-1-oxid (7k) [22]<sup>202</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 76,3; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 20,6 (<sup>3</sup>J = 13,0, C<sub>3</sub>–CH<sub>3</sub>), 30,9 (<sup>1</sup>J = 87,6, C<sub>2</sub>), 33,5 (<sup>1</sup>J = 91,6, C<sub>5</sub>), 66,2 (<sup>2</sup>J = 6,4, OCH<sub>2</sub>), 120,2 (<sup>2</sup>J = 11,0, C<sub>4</sub>), 127,8 (C<sub>2'</sub>), 128,3 (C<sub>4'</sub>), 128,5 (C<sub>3'</sub>), 136,1 (<sup>2</sup>J = 17,0, C<sub>3</sub>), 136,2 (<sup>3</sup>J = 5,5, C<sub>1'</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,75 (s, 3H, C<sub>3</sub>–CH<sub>3</sub>), 2,22–2,53 (m, 4H, PCH<sub>2</sub>), 5,08 (d, J = 8,8, 2H, OCH<sub>2</sub>), 5,49 (d, J = 37,1, 1H, CH), 7,29–7,40 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 223,0883, C<sub>12</sub>H<sub>16</sub>O<sub>2</sub>P-re számított: 223,0888.

1-*n*-Propoxi-3,4-dimetil-3-foszfólen-1-oxid (8a) [2c]<sup>186</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 68,5; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 10,1 (CH<sub>2</sub>CH<sub>3</sub>), 16,5 (<sup>3</sup>J = 15,9, C<sub>3</sub>–CH<sub>3</sub>), 23,9 (CH<sub>2</sub>CH<sub>3</sub>), 35,7 (<sup>1</sup>J = 90,8, C<sub>2</sub>), 66,3 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 127,4 (<sup>2</sup>J = 12,9, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,96 (t, J = 7,3, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,68–1,72 (m, 2H, CH<sub>2</sub>CH<sub>3</sub>), 1,72 (s, 6H C<sub>3</sub>–CH<sub>3</sub>), 2,38–2,51 (m, 4H, PCH<sub>2</sub>), 3,96–4,00 (m, 2H, OCH<sub>2</sub>), [M+H]<sup>+</sup><sub>mért</sub> = 189,1046, C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>P-re számított: 189,1044.

1-*n*-Butoxi-3,4-dimetil-3-foszfolén-1-oxid<sup>32</sup> (**8b**) [**2a**]<sup>186</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 68,4; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,6 (CH<sub>2</sub>CH<sub>3</sub>), 16,5 (<sup>3</sup>J = 15,9, C<sub>3</sub>-CH<sub>3</sub>), 18,8 (CH<sub>2</sub>CH<sub>3</sub>), 32,7 (<sup>3</sup>J = 5,9, OCH<sub>2</sub>CH<sub>2</sub>), 35,7 (<sup>1</sup>J = 90,8, C<sub>2</sub>), 64,5 (<sup>2</sup>J = 6,6, OCH<sub>2</sub>), 127,5 (<sup>2</sup>J = 12,9, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,94 (t, J = 7,4, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,37–1,44 (m, 2H, CH<sub>2</sub>CH<sub>3</sub>), 1,64–1,70 (m, 2H OCH<sub>2</sub>CH<sub>2</sub>), 1,72 (s, 6H C<sub>3</sub>-CH<sub>3</sub>), 2,37–2,50 (m, 4H, PCH<sub>2</sub>), 4,00–4,04 (m, 2H, OCH<sub>2</sub>); (δ lit<sup>32</sup> 1,73 (s, 6H, C<sub>3</sub>-CH<sub>3</sub>), 2,44 (d, J<sub>P,H</sub> = 13, 4H, PCH<sub>2</sub>), 4,01 (m, 2H, OCH<sub>2</sub>)); [M+H]<sup>+</sup><sub>mért</sub> = 203,1194, C<sub>10</sub>H<sub>19</sub>O<sub>2</sub>P-re számított: 203,1201.

1-*i*-Butoxi-3,4-dimetil-3-foszfolén-1-oxid (**8c**) [**2b**]<sup>186</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 68,5; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 16,4 (<sup>3</sup>J = 15,8, C<sub>3</sub>-CH<sub>3</sub>), 18,6 (CH(CH<sub>3</sub>)<sub>2</sub>), 29,1 (CHMe<sub>2</sub>), 35,5 (<sup>1</sup>J = 90,9, C<sub>2</sub>), 70,6 (<sup>1</sup>J = 6,9, OCH<sub>2</sub>), 127,3 (<sup>2</sup>J = 12,9, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,95 (d, J = 6,7, 6H, CH(CH<sub>3</sub>)<sub>2</sub>), 1,73 (s, 6H, C<sub>3</sub>-CH<sub>3</sub>), 1,91–1,98 (m, 1H, CH), 2,38–2,50 (m, 4H, PCH<sub>2</sub>), 3,76–3,79 (m, 2H, OCH<sub>2</sub>).

1-*n*-Pentiloxi-3,4-dimetil-3-foszfolén-1-oxid (**8d**) [**4a**]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 68,9; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,8 (CH<sub>2</sub>CH<sub>3</sub>), 16,4 (<sup>3</sup>J = 15,9, C<sub>3</sub>-CH<sub>3</sub>), 22,1 (CH<sub>2</sub>), 27,5 (CH<sub>2</sub>), 30,2 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 35,5 (<sup>1</sup>J = 90,9, C<sub>2</sub>), 64,9 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 127,3 (<sup>2</sup>J = 12,9, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,90 (t, J = 6,9, 3H, CH<sub>3</sub>), 1,28–1,38 (m, 4H, 2×CH<sub>2</sub>), 1,62–1,76 (m, 2H, CH<sub>2</sub>), átfedve 1,71 (s, 6H, 2×C<sub>3</sub>-CH<sub>3</sub>), 2,30–2,56 (m, 4H, PCH<sub>2</sub>), 3,95–4,05 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 217,1359, C<sub>11</sub>H<sub>22</sub>O<sub>2</sub>P-re számított: 217,1357.

1-(3-Metilbutoxi)-3,4-dimetil-3-foszfolén-1-oxid (**8f**) [**4b**]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 68,5; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 16,4 (<sup>3</sup>J = 15,9, C<sub>3</sub>-CH<sub>3</sub>), 22,2 (2×CH<sub>3</sub>), 24,5 (CH), 35,5 (<sup>1</sup>J = 90,7, C<sub>2</sub>), 39,2 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 63,1 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 127,3 (<sup>2</sup>J = 12,8, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,90 (d, J = 6,6, 6H, CH(CH<sub>3</sub>)<sub>2</sub>), 1,53–1,59 (m, 2H, OCH<sub>2</sub>CH<sub>2</sub>),

1,67–1,74 (m, 1H, CH(Me)<sub>2</sub>) és 1,70 (s, 6H, 2×C<sub>3</sub>–CH<sub>3</sub>) részben átfedve, 2,33–2,50 (m, 4H, PCH<sub>2</sub>), 4,00–4,06 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 217,1357, C<sub>11</sub>H<sub>22</sub>O<sub>2</sub>P-re számított: 217,1357.

1-*n*-Oktiloxi-3,4-dimetil-3-foszfolén-1-oxid (8g) [3b]<sup>189</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 69,2; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 16,5 (<sup>3</sup>J = 15,8, C<sub>3</sub>–CH<sub>3</sub>), 22,5 (CH<sub>2</sub>), 25,5 (CH<sub>2</sub>), 29,1 (2×CH<sub>2</sub>), 30,6 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 31,7 (CH<sub>2</sub>), 35,7 (<sup>1</sup>J = 90,8, C<sub>2</sub>), 64,8 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 127,4 (<sup>2</sup>J = 12,8, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,87 (t, J = 7,0, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,25–1,35 (m, 10H, CH<sub>2</sub>), 1,64–1,68 (m, 2H, CH<sub>2</sub>), 1,71 (s, 6H, C<sub>3</sub>–CH<sub>3</sub>), 2,36–2,49 (m, 4H, PCH<sub>2</sub>), 3,97–4,02 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 259,1829, C<sub>14</sub>H<sub>28</sub>O<sub>2</sub>P-re számított: 259,1827.

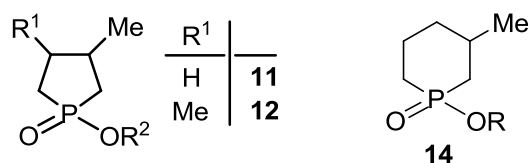
1-*i*-Oktiloxi-3,4-dimetil-3-foszfolén-1-oxid (8h) [4c]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 68,4; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 10,9 (CHCH<sub>3</sub>), 14,0 (CHCH<sub>3</sub>), 16,5 (<sup>3</sup>J = 15,8, C<sub>3</sub>–CH<sub>3</sub>), 22,9 (CH<sub>2</sub>), 23,3 (CH<sub>2</sub>), 28,8 (CH<sub>2</sub>), 29,9 (CH<sub>2</sub>), 35,6 (<sup>1</sup>J = 90,8, C<sub>2</sub>), 40,1 (<sup>3</sup>J = 6,4, OCH<sub>2</sub>CH), 66,9 (<sup>2</sup>J = 6,9, OCH<sub>2</sub>), 127,4 (<sup>2</sup>J = 12,8, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,87 (t, J = 7,1, 6H, 2×CH<sub>2</sub>CH<sub>3</sub>), 1,19–1,43 (m, 8H, 4×CH<sub>2</sub>), 1,44–1,60 (m, 1H, OCH<sub>2</sub>CH), 1,70 (s, 6H, C<sub>3</sub>–CH<sub>3</sub>), 2,29–2,52 (m, 4H, PCH<sub>2</sub>), 3,81–3,95 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 259,1830, C<sub>14</sub>H<sub>28</sub>O<sub>2</sub>P-re számított: 259,1827.

1-*n*-Dodeciloxi-3,4-dimetil-3-foszfolén-1-oxid (8i) [3a]<sup>189</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 68,6; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,1 (CH<sub>2</sub>CH<sub>3</sub>), 16,5 (<sup>3</sup>J = 15,9, C<sub>3</sub>–CH<sub>3</sub>), 22,7 (CH<sub>2</sub>), 25,6 (CH<sub>2</sub>), 29,2 (CH<sub>2</sub>), 29,4 (CH<sub>2</sub>), 29,5 (CH<sub>2</sub>), 29,57 (CH<sub>2</sub>), 29,64 (2×CH<sub>2</sub>), 30,7 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 31,9 (CH<sub>2</sub>), 35,7 (<sup>1</sup>J = 90,8, C<sub>2</sub>), 64,9 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 127,5 (<sup>2</sup>J = 12,9, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,88 (t, J = 6,9, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,23–1,38 (m, 18H, CH<sub>2</sub>), 1,65–1,73 (m, 2H, CH<sub>2</sub>), 1,73 (s, 6H, C<sub>3</sub>–CH<sub>3</sub>), 2,37–2,50 (m, 4H, PCH<sub>2</sub>), 3,99–4,03 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 315,2453, C<sub>18</sub>H<sub>36</sub>O<sub>2</sub>P-re számított: 315,2453.

## 4. TELÍTETT GYŰRŰS FOSZFINÁTOK (11, 12 és 14)

1-*n*-Butoxi-3-metil-foszfólán-1-oxid (11a) [23]<sup>74</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) 79,40 (50%) és 79,38 (50%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,7 (CH<sub>2</sub>CH<sub>3</sub>), 18,9 (CH<sub>2</sub>CH<sub>3</sub>), 21,3 (*J* = 7,6) és 21,5 (*J* = 6,9) C<sub>3</sub>-CH<sub>3</sub>, 25,4 (*J* = 88,1) és 26,1 (*J* = 87,6) C<sub>5</sub>; 31,3 (*J* = 9,7) és 31,5 (*J* = 9,8) C<sub>4</sub>, 31,9 (*J* = 12,9) és 32,2 (*J* = 12,9) C<sub>3</sub>; 32,7 (OCH<sub>2</sub>CH<sub>2</sub>), 32,8 (OCH<sub>2</sub>CH<sub>2</sub>), 32,9 (*J* = 89,6) és 33,2 (*J* = 89,2) C<sub>2</sub>, 64,4 (*J* = 6,7) és 64,5 (*J* = 6,8) OCH<sub>2</sub>; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,94 (t, *J* = 7,3, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,10 (d, *J* = 4,8) és 1,12 (d, *J* = 4,8) totál intenzitás 3H, C<sub>3</sub>-CH<sub>3</sub>, 1,25–1,47 (m, CH<sub>2</sub>, 4H), 1,62–1,75 (m, 2H, CH<sub>2</sub>), 1,87–2,17 (m, 5H, CH<sub>2</sub>, CH), 3,96–4,03 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 191,1200, C<sub>9</sub>H<sub>20</sub>O<sub>2</sub>P-re számított: 191,1201.

1-*n*-Pentoxi-3-metil-foszfólán-1-oxid (11b) [7a]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 79,4 (a két izomerre együtt, izomerarány: 70–30%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**A**): 13,9 (CH<sub>2</sub>CH<sub>3</sub>), 21,2 (<sup>3</sup>*J* = 15,0, C<sub>3</sub>-CH<sub>3</sub>), 22,2 (CH<sub>2</sub>CH<sub>3</sub>), 25,4 (<sup>1</sup>*J* = 88,1, C<sub>5</sub>), 27,7 (CH<sub>2</sub>), 30,3 (<sup>3</sup>*J* = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 31,2 (<sup>2</sup>*J* = 9,7, C<sub>4</sub>)<sup>a</sup>, 31,8 (<sup>2</sup>*J* = 12,9, C<sub>3</sub>)<sup>a</sup>, 33,1 (<sup>1</sup>*J* = 89,1, C<sub>2</sub>), 64,6 (<sup>2</sup>*J* = 6,7, OCH<sub>2</sub>); a minor izomerre (**B**): 13,9 (CH<sub>2</sub>CH<sub>3</sub>), 21,3 (<sup>3</sup>*J* = 14,3, C<sub>3</sub>-CH<sub>3</sub>), 22,2 (CH<sub>2</sub>CH<sub>3</sub>), 26,0 (<sup>1</sup>*J* = 87,5), C<sub>5</sub>, 27,7 (CH<sub>2</sub>), 30,3 (<sup>3</sup>*J* = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 31,4 (<sup>2</sup>*J* = 9,9, C<sub>4</sub>)<sup>b</sup>, 32,0 (<sup>2</sup>*J* = 12,9, C<sub>3</sub>)<sup>b</sup>, 32,8 (<sup>1</sup>*J* = 89,6, C<sub>2</sub>), 64,6 (<sup>2</sup>*J* = 6,6, OCH<sub>2</sub>), <sup>a,b</sup>felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,91 (t, *J* = 7,0, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,10 (d, *J* = 6,5, 3H, C<sub>3</sub>-CH<sub>3</sub>), 1,24–1,38 (m, 6H, CH<sub>2</sub>), 1,62–1,76 (m, 4H, CH<sub>2</sub>), 1,88–2,03 (m, 2H, CH<sub>2</sub>), 2,11–2,22 (m, 1H, CH), 3,93–4,03 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 205,1362, C<sub>10</sub>H<sub>21</sub>O<sub>2</sub>P-re számított: 205,1357.

1-(3-Metilbutoxi)-3-metil-foszfolán-1-oxid (11c) [7b]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 80,66 (75%) és 80,72 (25%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**A**): 21,1 (<sup>3</sup>J = 15,0, C<sub>3</sub>-CH<sub>3</sub>), 22,3 (2×CH<sub>3</sub>), 24,6 (CH), 25,2 (<sup>1</sup>J = 88,0, C<sub>5</sub>), 31,1 (<sup>2</sup>J = 9,8, C<sub>4</sub>)<sup>a</sup>, 31,8 (<sup>2</sup>J = 13,0, C<sub>3</sub>)<sup>a</sup>, 32,9 (<sup>1</sup>J = 89,3, C<sub>2</sub>), 39,2 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 63,28 (<sup>2</sup>J = 6,8, OCH<sub>2</sub>); a minor izomerre (**B**): 21,2 (<sup>3</sup>J = 14,3, C<sub>3</sub>-CH<sub>3</sub>), 22,3 (2×CH<sub>3</sub>), 24,6 (CH), 25,8 (<sup>1</sup>J = 87,7, C<sub>5</sub>), 31,3 (<sup>2</sup>J = 10,0, C<sub>4</sub>)<sup>b</sup>, 32,1 (<sup>2</sup>J = 13,3, C<sub>3</sub>)<sup>b</sup>, 32,6 (<sup>1</sup>J = 90,3, C<sub>2</sub>), 39,2 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 63,33 (<sup>2</sup>J = 6,8, OCH<sub>2</sub>), <sup>a,b</sup> felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,91 (d, J = 6,6, 6H, CH(CH<sub>3</sub>)<sub>2</sub>), 1,09 (bd, J = 5,7, 3H, C<sub>3</sub>-CH<sub>3</sub>), 1,18–1,38 (m, 2H, CH<sub>2</sub>), 1,50–1,60 (m, 2H, CH<sub>2</sub>), 1,62–1,80 (m, 2H, CH<sub>2</sub>), 1,82–2,02 (m, 3H, CH<sub>2</sub>, CH), 2,07–2,25 (m, 1H, CH), 3,94–4,08 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 227,1177, C<sub>10</sub>H<sub>21</sub>O<sub>2</sub>P-re számított: 227,1177.

1-n-Oktiloxi-3-metil-foszfolán-1-oxid (11d) [8]<sup>189</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 79,61 (50%) és 79,66 (50%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,2 (CH<sub>2</sub>CH<sub>3</sub>), 21,4 (<sup>3</sup>J = 14,7) és 21,5 (<sup>3</sup>J = 12,3) C<sub>3</sub>-CH<sub>3</sub>, 22,7 (CH<sub>2</sub>CH<sub>3</sub>), 25,5 (<sup>1</sup>J = 87,9) és 26,2 (<sup>1</sup>J = 87,4) C<sub>5</sub>, 25,7 (CH<sub>2</sub>), 29,3 (2×CH<sub>2</sub>), 30,8 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 31,4 (<sup>2</sup>J = 9,7) és 31,6 (<sup>2</sup>J = 9,8) C<sub>4</sub><sup>\*</sup>, 31,9 (CH<sub>2</sub>), 32,0 (<sup>2</sup>J = 13,0) és 32,2 (<sup>2</sup>J = 13,0) C<sub>3</sub><sup>\*</sup>, 33,0 (<sup>1</sup>J = 89,6) és 33,3 (<sup>1</sup>J = 89,2) C<sub>2</sub>, 64,8 (<sup>2</sup>J = 6,5, OCH<sub>2</sub>), <sup>\*</sup>felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,87 (t, J = 7,0, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,07–1,12 (m, 3H, C<sub>3</sub>-CH<sub>3</sub>), 1,20–1,40 (m, 12H, CH<sub>2</sub>), 1,61–1,80 (m, 2H, CH<sub>2</sub>), 1,87–2,10 (m, 5H, CH<sub>2</sub>, CH), 3,93–4,00 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 247,1828, C<sub>13</sub>H<sub>28</sub>O<sub>2</sub>P-re számított: 247,1827.

1-(2-Etilhexiloxi)-3-metil-foszfolán-1-oxid (11e) [7c]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 79,43 (40%) és 79,48 (60%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**A**): 10,9 (CH<sub>3</sub>), 14,0 (CH<sub>3</sub>), 21,35 (<sup>3</sup>J = 14,0, C<sub>3</sub>-CH<sub>3</sub>), 22,9 (CH<sub>2</sub>), 23,3 (CH<sub>2</sub>), 25,9 (<sup>1</sup>J = 87,6, C<sub>5</sub>), 28,8 (CH<sub>2</sub>), 29,9 (CH<sub>2</sub>), 31,4 (<sup>2</sup>J = 9,9, C<sub>4</sub>)<sup>a</sup>, 32,0 (<sup>2</sup>J = 12,6, C<sub>3</sub>)<sup>a</sup>, 32,6 (<sup>1</sup>J = 89,5, C<sub>2</sub>), 40,1 (<sup>3</sup>J = 6,5, OCH<sub>2</sub>CH), 66,8 (<sup>2</sup>J = 7,0, OCH<sub>2</sub>); a minor izomerre (**B**): 10,9 (CH<sub>3</sub>), 14,0 (CH<sub>3</sub>), 21,25 (<sup>3</sup>J = 15,0, C<sub>3</sub>-CH<sub>3</sub>), 22,9 (CH<sub>2</sub>), 23,3 (CH<sub>2</sub>), 25,2 (<sup>1</sup>J = 88,1, C<sub>5</sub>), 28,8 (CH<sub>2</sub>),

29,9 (CH<sub>2</sub>), 31,2 (<sup>2</sup>J = 9,7, C<sub>4</sub>)<sup>b</sup>, 31,8 (<sup>2</sup>J = 12,8, C<sub>3</sub>)<sup>b</sup>, 33,0 (<sup>1</sup>J = 89,2, C<sub>2</sub>), 40,1 (<sup>3</sup>J = 6,5, OCH<sub>2</sub>CH), 66,7 (<sup>2</sup>J = 6,9, OCH<sub>2</sub>), <sup>a,b</sup>felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,89 (t, J = 7,2, 6H, CH<sub>2</sub>CH<sub>3</sub>), 1,09 (d, J = 5,9, 3H, C<sub>3</sub>-CH<sub>3</sub>), 3,79–3,96 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 247,1823, C<sub>13</sub>H<sub>28</sub>O<sub>2</sub>P-re számított: 247,1827.

1-n-Butoxi-3,4-dimetil-foszfólán-1-oxid (12a) [24]<sup>74</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 72,5 (60%), 78,4 (20%) és 79,0 (20%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**A**): 13,8 (CH<sub>2</sub>CH<sub>3</sub>), 19,0 (CH<sub>2</sub>CH<sub>3</sub>), 19,0 (J = 15,4) és 19,3 (J = 15,4), C<sub>3</sub>-CH<sub>3</sub>, 32,8 (J = 6,0) OCH<sub>2</sub>CH<sub>2</sub>, 34,5 (J = 88,5, C<sub>5</sub>), 34,8 (J = 88,1, C<sub>2</sub>), 38,8 (J = 10,8) és 38,9 (J = 10,8) C<sub>3</sub>, 64,5 (J = 6,7) OCH<sub>2</sub>; a minor izomerre (**B-1** és **B-2**): 13,8 (CH<sub>2</sub>CH<sub>3</sub>), 15,9 (J = 9,1) és 16,3 (9,4) C<sub>3</sub>-CH<sub>3</sub>, 19,0 (CH<sub>2</sub>CH<sub>3</sub>), 32,1 (J = 87,6) és 32,2 (J = 87,6) C<sub>2</sub>, 32,8 (J = 6,0) OCH<sub>2</sub>CH<sub>2</sub>, 34,9 (J = 11,2) és 35,1 (J = 12,5) C<sub>2</sub>, 64,4 (J = 4,8) és 64,6 (J = 6,9) OCH<sub>2</sub>; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,94 (t, J = 7,4, 3H CH<sub>2</sub>CH<sub>3</sub>), 0,98 (d, J = 6,3) és 1,04 (J = 6,6) C<sub>3</sub>-CH<sub>3</sub> [minor], 1,09 (bd, J ~ 5,5, C<sub>3</sub>-CH<sub>3</sub> [major]), 1,34–2,18 (m, 10H, CH<sub>2</sub>, CH), 3,94–4,03 (m, OCH<sub>2</sub>, 2H); [M+H]<sup>+</sup><sub>mért</sub> = 205,1350, C<sub>10</sub>H<sub>22</sub>O<sub>2</sub>P-re számított: = 205,1357.

1-n-Pentoxi-3,4-dimetil-foszfólán-1-oxid (12b) [8a]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 73,2 (80%) 79,1 (10%) és 79,8 (10%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**A**): 13,9 (CH<sub>2</sub>CH<sub>3</sub>), 18,8 (<sup>3</sup>J = 16,3, C<sub>3</sub>-CH<sub>3</sub>), 19,0 (<sup>3</sup>J = 15,3, C<sub>4</sub>-CH<sub>3</sub>), 22,2 (CH<sub>2</sub>), 27,7 (CH<sub>2</sub>), 30,3 (<sup>3</sup>J = 6,1, OCH<sub>2</sub>CH<sub>2</sub>), 34,2 (<sup>1</sup>J = 88,6, C<sub>2</sub>)<sup>a</sup>, 34,5 (<sup>1</sup>J = 88,2, C<sub>5</sub>)<sup>a</sup>, 38,61 (<sup>2</sup>J = 10,9, C<sub>3</sub>)<sup>b</sup>, 38,62 (<sup>2</sup>J = 10,9, C<sub>4</sub>)<sup>b</sup>, 64,7 (<sup>2</sup>J = 6,8, OCH<sub>2</sub>); a minor izomerre (**B-1** és **B-2**): 13,9 (CH<sub>2</sub>CH<sub>3</sub>), 16,5 (<sup>3</sup>J = 9,1) és 16,0 (<sup>3</sup>J = 9,4) C<sub>3</sub>-CH<sub>3</sub>, 22,2 (CH<sub>2</sub>), 27,7 (CH<sub>2</sub>), 30,3 (<sup>3</sup>J = 6,1, OCH<sub>2</sub>CH<sub>2</sub>), 31,2 (<sup>1</sup>J = 87,6) és 32,0 (<sup>1</sup>J = 87,5) C<sub>2</sub>, 34,7 (<sup>2</sup>J = 10,8) és 34,8 (<sup>2</sup>J = 9,8) C<sub>3</sub>, 64,7 (<sup>2</sup>J = 6,6) és 64,9 (<sup>2</sup>J = 6,9) OCH<sub>2</sub>; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,89 (t, J = 6,8, 3H, CH<sub>2</sub>CH<sub>3</sub>), 0,96 (d, J = 6,6) és 1,02 (d, J = 6,6) C<sub>3</sub>-CH<sub>3</sub> [minor], 1,07 (bd, J = 6,0, C<sub>3</sub>-CH<sub>3</sub> [major]), 3,89–4,02 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 219,1513, C<sub>11</sub>H<sub>24</sub>O<sub>2</sub>P-re számított: 219,1514.



1-(3-Metilbutoxi)-3,4-dimetil-foszfólán-1-oxid (12c) [8b]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 73,0 (71%), 78,8 (29%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**A**): 18,8 (<sup>3</sup>J = 16,3, C<sub>3</sub>-CH<sub>3</sub>), 19,0 (<sup>3</sup>J = 15,3, C<sub>4</sub>-CH<sub>3</sub>), 22,3 (2×CH<sub>3</sub>), 24,6 (CH), 34,2 (<sup>1</sup>J = 88,3, C<sub>2</sub>), 34,5 (<sup>1</sup>J = 88,2, C<sub>5</sub>), 38,6 (<sup>2</sup>J = 9,8, C<sub>3</sub> és C<sub>4</sub>), 39,3 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 63,1 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>); a minor izomerre (**B**): 16,0 (<sup>3</sup>J = 9,3, C<sub>3</sub>-CH<sub>3</sub>), 22,3 (2×CH<sub>3</sub>), 24,6 (CH), 31,8 (<sup>1</sup>J = 87,5, C<sub>2</sub>), 34,7 (<sup>1</sup>J = 11,2, C<sub>3</sub>), 63,0 (<sup>2</sup>J = 6,6, OCH<sub>2</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,90 (d, J = 6,6, 6H, CH(CH<sub>3</sub>)<sub>2</sub>), 0,94 (d, J = 6,5) és 1,01 (d, J = 6,5) C<sub>3</sub>-CH<sub>3</sub> [minor], 1,05 (d, J = 5,2) C<sub>3</sub>-CH<sub>3</sub>\* [major], 1,07 (d, J = 6,0) C<sub>4</sub>-CH<sub>3</sub>\* [major], 3,92–4,04 (m, 2H, OCH<sub>2</sub>), \* felcserélhető; [M+H]<sup>+</sup><sub>mért</sub> = 219,1513, C<sub>11</sub>H<sub>24</sub>O<sub>2</sub>P-re számított: 219,1514.

1-n-Oktiloxi-3,4-dimetil-foszfólán-1-oxid (12d) [7]<sup>189</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 72,4 (60%), 78,3 (20%) és 79,0 (20%); [M+H]<sup>+</sup><sub>mért</sub> = 261,1985, C<sub>14</sub>H<sub>30</sub>O<sub>2</sub>P-re számított: 261,1983.

A major izomerre (**A**): <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 18,8 (<sup>3</sup>J = 15,7, C<sub>3</sub>-CH<sub>3</sub>)<sup>a</sup>, 19,0 (<sup>3</sup>J = 14,7, C<sub>4</sub>-CH<sub>3</sub>)<sup>a</sup>, 22,5 (CH<sub>2</sub>CH<sub>3</sub>), 25,5 (CH<sub>2</sub>), 29,1 (2×CH<sub>2</sub>), 30,6 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 31,7 (CH<sub>2</sub>), 34,3 (<sup>1</sup>J = 88,5, C<sub>2</sub>)<sup>b</sup>, 34,6 (<sup>1</sup>J = 88,1, C<sub>5</sub>)<sup>b</sup>, 38,59 (<sup>2</sup>J = 10,8, C<sub>3</sub>)<sup>c</sup>, 38,62 (<sup>2</sup>J = 10,8, C<sub>4</sub>)<sup>c</sup>, 64,52 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), <sup>a-c</sup> felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,84 (t, J = 6,7, CH<sub>2</sub>CH<sub>3</sub>), 1,03–1,06 (m, C<sub>3</sub>-CH<sub>3</sub> és C<sub>4</sub>-CH<sub>3</sub>), 3,88–4,00 (m, 2H, OCH<sub>2</sub>).

A minor izomerekre (**B-1** és **B-2**): <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 15,7 (<sup>3</sup>J = 9,2) és 16,0 (<sup>3</sup>J = 9,3) C<sub>3</sub>-CH<sub>3</sub>, 22,5 (CH<sub>2</sub>CH<sub>3</sub>), 25,5 (CH<sub>2</sub>), 29,1 (2×CH<sub>2</sub>), 30,5 (<sup>3</sup>J = 6,2) és 30,6 (<sup>3</sup>J = 6,0) OCH<sub>2</sub>CH<sub>2</sub>, 31,7 (CH<sub>2</sub>), 31,8 (<sup>1</sup>J = 87,5) és 32,0 (<sup>1</sup>J = 87,5) C<sub>2</sub>, 34,7 (<sup>2</sup>J = 12,1) és 34,8 (<sup>2</sup>J = 12,4) C<sub>3</sub>, 64,46 (<sup>2</sup>J = 6,5) és 64,68 (<sup>2</sup>J = 6,8) OCH<sub>2</sub>; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,84 (t, J = 6,7, CH<sub>2</sub>CH<sub>3</sub>), 0,93 (d, J = 6,7) és 0,99 (d, J = 6,7) C<sub>3</sub>-CH<sub>3</sub>), 3,88–4,00 (m, 2H, OCH<sub>2</sub>).

1-(2-Etilhexiloxi)-3,4-dimetil-foszfólán-1-oxid (12e) [8c]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 72,5 (69%), 79,2 (31%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**A**): 10,9 (CH<sub>3</sub>), 14,0 (CH<sub>3</sub>), 18,9 (<sup>3</sup>J = 18,1, C<sub>3</sub>-CH<sub>3</sub>), 19,1 (<sup>3</sup>J = 15,9, C<sub>4</sub>-CH<sub>3</sub>), 22,9 (CH<sub>2</sub>), 23,4 (CH<sub>2</sub>), 28,9 (CH<sub>2</sub>), 30,0 (CH<sub>2</sub>), 34,1 (<sup>1</sup>J = 88,5, C<sub>5</sub>), 34,5 (<sup>1</sup>J = 88,2, C<sub>2</sub>), 38,65 (<sup>2</sup>J = 10,8, C<sub>4</sub>), 38,68 (<sup>2</sup>J = 10,8, C<sub>3</sub>), 40,1 (<sup>3</sup>J = 6,6, OCH<sub>2</sub>CH), 66,7 (<sup>2</sup>J = 6,9, OCH<sub>2</sub>); a minor izomerre (**B**): 10,9 (CH<sub>3</sub>), 14,0 (CH<sub>3</sub>), 15,8 (<sup>3</sup>J = 9,1, C<sub>3</sub>-CH<sub>3</sub>), 22,9 (CH<sub>2</sub>), 23,4 (CH<sub>2</sub>), 28,9 (CH<sub>2</sub>), 30,0 (CH<sub>2</sub>), 32,0 (<sup>1</sup>J = 87,6, C<sub>2</sub>), 34,9 (<sup>2</sup>J = 11,4, C<sub>3</sub>), 66,7 (<sup>2</sup>J = 7,0, OCH<sub>2</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,89 (t, J = 7,5, 6H, CH<sub>2</sub>CH<sub>3</sub>), 0,97 (d, J = 6,6) [minor], 1,08 (bd, J = 5,5, C<sub>3</sub>-CH<sub>3</sub>) és 1,09 (bd, J = 5,4, C<sub>3</sub>-CH<sub>3</sub>) [major], 3,81–3,92 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 261,1985, C<sub>14</sub>H<sub>30</sub>O<sub>2</sub>P-re számított: 261,1983.

1-n-Butoxi-1,2,3,4,5,6-hexahidrofoszfinin-1-oxid (14a) [25]<sup>74</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 50,4 (55%), 51,7 (45%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,61 és 13,64 (CH<sub>2</sub>CH<sub>3</sub>), 18,8 és 18,9 (CH<sub>2</sub>CH<sub>3</sub>), 21,9 (J = 3,7) és 22,9 (J = 5,1) C<sub>3</sub>, 24,1 (J = 16,2) és 24,3 (J = 16,5) C<sub>3</sub>-CH<sub>3</sub>, 26,3 (J = 86,5) és 25,7 (J = 85,8) C<sub>6</sub>; 30,5 (J = 3,0) és 31,5 (J = 4,6) C<sub>4</sub><sup>\*</sup>, 32,7 (J = 4,5) és 32,8 (J = 4,2) C<sub>5</sub><sup>\*</sup>; 34,7 (J = 6,2) és 35,1 (J = 6,2) OCH<sub>2</sub>CH<sub>2</sub>, 35,0 (J = 84,0) és 35,3 (J = 84,0) C<sub>2</sub>, 63,2 (J = 6,4) és 63,8 (J = 6,6) OCH<sub>2</sub>; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,93 (t, J = 7,3, CH<sub>2</sub>CH<sub>3</sub> [major]) és 1,03 (t, J = 6,8, CH<sub>2</sub>CH<sub>3</sub> [minor]), 0,94 (d, J = 4,5, C<sub>3</sub>-CH<sub>3</sub> [major]) és 1,03 (d, J = 6,51, C<sub>3</sub>-CH<sub>3</sub> [minor]) részben átlapolva, totál intenzitás 6H, 1,12–2,27 (m, 13H, CH<sub>2</sub>, CH), 3,94–4,03 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 205,1360, C<sub>10</sub>H<sub>22</sub>O<sub>2</sub>P-re számított: 205,1357.

1-n-Oktiloxi-1,2,3,4,5,6-hexahidrofoszfinin-1-oxid (14b) [10d]<sup>188</sup>

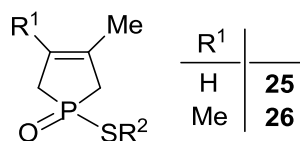
<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 50,3 (66%), 51,6 (34%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**A**): 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 22,5 (CH<sub>2</sub>CH<sub>3</sub>), 22,9 (<sup>2</sup>J = 5,1, C<sub>3</sub>), 24,2 (<sup>3</sup>J = 16,5, C<sub>3</sub>-CH<sub>3</sub>), 25,6 (CH<sub>2</sub>), 25,7 (<sup>1</sup>J = 85,8, C<sub>6</sub>), 29,1 (2×CH<sub>2</sub>), 30,6 (<sup>2</sup>J = 6,2, C<sub>4</sub>)<sup>a</sup>, 31,4 (<sup>3</sup>J = 4,6, C<sub>5</sub>)<sup>a</sup>, 31,7 (CH<sub>2</sub>), 34,7 (<sup>3</sup>J = 6,4,

OCH<sub>2</sub>CH<sub>2</sub>), 35,0 (<sup>1</sup>J = 84,0, C<sub>2</sub>), 63,5 (<sup>2</sup>J = 6,4, OCH<sub>2</sub>); a minor izomerre (**B**): 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 21,9 (<sup>2</sup>J = 3,8, C<sub>3</sub>), 22,5 (CH<sub>2</sub>CH<sub>3</sub>), 24,0 (<sup>3</sup>J = 16,2, C<sub>3</sub>-CH<sub>3</sub>), 25,5 (CH<sub>2</sub>), 26,3 (<sup>1</sup>J = 86,4, C<sub>6</sub>), 29,1 (2×CH<sub>2</sub>), 30,4 (<sup>3</sup>J = 3,0, C<sub>4</sub>)<sup>b</sup>, 30,7 (<sup>2</sup>J = 6,0, C<sub>5</sub>)<sup>b</sup>, 31,7 (CH<sub>2</sub>), 35,0 (<sup>3</sup>J = 6,2, OCH<sub>2</sub>CH<sub>2</sub>), 35,3 (<sup>1</sup>J = 84,1, C<sub>2</sub>), 64,0 (<sup>2</sup>J = 6,6, OCH<sub>2</sub>), <sup>a,b</sup> felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,88 (t, J = 7,1, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,00 (d, J = 3,0, C<sub>3</sub>-CH<sub>3</sub> [minor]) és 1,02 (d, J = 2,9, C<sub>3</sub>-CH<sub>3</sub> [major]) részben átlapolva, teljes intenzitás 3H, 1,21–1,42 (m, 12H, CH<sub>2</sub>), 1,48–1,74 (m, 4H, CH<sub>2</sub>, CH), 1,75–2,05 (m, 5H, CH<sub>2</sub>, CH), 3,91–4,01 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 261,1984, C<sub>14</sub>H<sub>30</sub>O<sub>2</sub>P-re számított: 261,1983.

1-(2-Etilhexiloxi)-1,2,3,4,5,6-hexahidrofoszfinin-1-oxid (14c) [10c]<sup>188</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 50,4 (31%) és 51,8 (69%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**B**): 10,85 (CH<sub>2</sub>CH<sub>3</sub>), 13,9 (CH<sub>2</sub>CH<sub>3</sub>), 21,9 (<sup>2</sup>J = 3,7, C<sub>3</sub>), 22,9 (CH<sub>2</sub>CH<sub>3</sub>), 23,2 (CH<sub>2</sub>CH<sub>3</sub>), 24,0 (<sup>3</sup>J = 16,0, C<sub>3</sub>-CH<sub>3</sub>), 26,2 (<sup>1</sup>J = 86,3, C<sub>6</sub>), 28,9 (CH<sub>2</sub>), 29,9 (CH<sub>2</sub>), 30,4 (<sup>3</sup>J = 3,0, C<sub>4</sub>)<sup>a</sup>, 35,0 (<sup>2</sup>J = 6,2, C<sub>5</sub>)<sup>a</sup>, 35,1 (<sup>1</sup>J = 83,8, C<sub>2</sub>), 40,2 (<sup>3</sup>J = 6,1, OCH<sub>2</sub>CH), 66,1 (<sup>2</sup>J = 6,8, OCH<sub>2</sub>); a minor izomerre (**A**): 10,89 (CH<sub>2</sub>CH<sub>3</sub>), 13,9 (CH<sub>2</sub>CH<sub>3</sub>), 22,8 (<sup>2</sup>J = 4,7, C<sub>3</sub>), 22,9 (CH<sub>2</sub>CH<sub>3</sub>), 23,3 (CH<sub>2</sub>CH<sub>3</sub>), 24,2 (<sup>3</sup>J = 15,9) C<sub>3</sub>-CH<sub>3</sub>, 25,6 (<sup>1</sup>J = 85,9, C<sub>6</sub>), 28,9 (CH<sub>2</sub>), 29,9 (CH<sub>2</sub>), 31,5 (<sup>3</sup>J = 4,6, C<sub>4</sub>)<sup>b</sup>, 34,9 (<sup>1</sup>J = 84,0, C<sub>2</sub>), 34,6 (<sup>2</sup>J = 6,8, C<sub>5</sub>)<sup>b</sup>, 40,2 (<sup>3</sup>J = 6,1, OCH<sub>2</sub>CH), 65,5 (<sup>2</sup>J = 6,4, OCH<sub>2</sub>), <sup>a,b</sup> felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,87 (t, J = 7,5, 6H, CH<sub>2</sub>CH<sub>3</sub>), 1,01 (d, J = 2,8, C<sub>3</sub>-CH<sub>3</sub> [major]) és 1,02 (d, J = 2,8, C<sub>3</sub>-CH<sub>3</sub> [minor]) részben átlapolva, teljes intenzitás 3H, 1,22–1,41 (m, 10H, CH<sub>2</sub>, CH), 1,42–1,58 (m, 2H, CH<sub>2</sub>), 1,65–2,15 (m, 6H, CH<sub>2</sub>, CH), 3,80–3,92 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 261,1975, C<sub>14</sub>H<sub>30</sub>O<sub>2</sub>P-re számított: 261,1983.

## 5. TIOFOSZFINÁTOK (25 és 26)

1-*n*-Tiobutoxi-3-metil-3-foszfolén-1-oxid (25a) [14a]<sup>202</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 75,2; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 12,8 (CH<sub>2</sub>CH<sub>3</sub>), 19,6 (<sup>3</sup>J = 11,8, C<sub>3</sub>-CH<sub>3</sub>), 21,0 (CH<sub>2</sub>CH<sub>3</sub>), 27,6 (CH<sub>2</sub>), 32,6 (SCH<sub>2</sub>), 36,7 (<sup>1</sup>J = 66,0, C<sub>2</sub>), 39,4 (<sup>1</sup>J = 69,1, C<sub>5</sub>), 119,5 (<sup>2</sup>J = 9,5, C<sub>4</sub>), 135,5 (<sup>2</sup>J = 15,1, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,88 (t, J = 7,3, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,31–1,47 (m, 2H, CH<sub>2</sub>CH<sub>3</sub>), 1,60–1,72 (m, 2H, CH<sub>2</sub>), 1,76 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,45–2,83 (m, 4H, PCH<sub>2</sub>), 2,83–2,96 (m, 2H, SCH<sub>2</sub>), 5,48 (d, J = 35,4, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 205,0821, C<sub>9</sub>H<sub>18</sub>OPS-re számított: 205,0816.

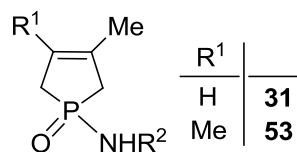
1-*n*-Tiopentoxi-3-metil-3-foszfolén-1-oxid (25b) [14b]<sup>202</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 74,5; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,2 (CH<sub>2</sub>CH<sub>3</sub>), 19,6 (<sup>3</sup>J = 12,0, C<sub>3</sub>-CH<sub>3</sub>), 21,4 (CH<sub>2</sub>CH<sub>3</sub>), 27,9 (CH<sub>2</sub>), 30,1 (SCH<sub>2</sub>CH<sub>2</sub>), 30,2 (<sup>2</sup>J = 3,5 SCH<sub>2</sub>), 36,7 (<sup>1</sup>J = 65,9, C<sub>2</sub>), 39,4 (<sup>1</sup>J = 69,1, C<sub>5</sub>), 119,5 (<sup>2</sup>J = 9,7, C<sub>4</sub>), 135,5 (<sup>2</sup>J = 15,2, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,90 (t, J = 7,0, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,25–1,47 (m, 4H, 2×CH<sub>2</sub>), 1,64–1,77 (m, 2H, SCH<sub>2</sub>CH<sub>2</sub>), 1,82 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,50–2,88 (m, 4H, PCH<sub>2</sub>), 2,88–3,02 (m, 2H, SCH<sub>2</sub>), 5,53 (d, J = 36,0, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 219,0977, C<sub>10</sub>H<sub>20</sub>OPS-re számított: 219,0973.

1-*n*-Tiopentoxi-3,4-dimetil-3-foszfolén-1-oxid (26b) [15]<sup>202</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 67,5; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,7 (CH<sub>2</sub>CH<sub>3</sub>), 16,2 (<sup>3</sup>J = 12,0, C<sub>3</sub>-CH<sub>3</sub>), 21,9 (CH<sub>2</sub>CH<sub>3</sub>), 28,4 (<sup>3</sup>J = 2,6 SCH<sub>2</sub>CH<sub>2</sub>), 30,6 (CH<sub>2</sub>), 30,8 (<sup>2</sup>J = 3,9 SCH<sub>2</sub>), 42,2 (<sup>1</sup>J = 68,1, C<sub>2</sub>), 127,1 (<sup>2</sup>J = 11,2, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,82 (t, J = 7,0, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,17–1,40 (m, 4H, 2×CH<sub>2</sub>), 1,59–1,73 (m, teljes intenzitás 8H, 2×C<sub>3</sub>-CH<sub>3</sub>, CH<sub>2</sub>), 2,48–2,64 (m, 2H, SCH<sub>2</sub>), 2,66–2,94 (m, 4H, PCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 233,1130, C<sub>11</sub>H<sub>22</sub>OPS-re számított: 233,1129.

## 6. TELÍTETLEN GYŰRŰS FOSZFINSAV-AMIDOK (31 és 53)

1-*n*-Propilamino-3-metil-3-foszfolén-1-oxid (31h) [3a]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 63,2; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 11,2 (CH<sub>2</sub>CH<sub>3</sub>), 20,6 (d, <sup>3</sup>J = 12,1, C<sub>3</sub>-CH<sub>3</sub>), 25,2 (d, <sup>3</sup>J = 6,3, NCH<sub>2</sub>CH<sub>2</sub>), 32,1 (d, <sup>1</sup>J = 82,1, C<sub>5</sub>), 35,0 (d, <sup>1</sup>J = 85,6, C<sub>2</sub>), 42,4 (d, <sup>2</sup>J = 1,7, NCH<sub>2</sub>), 120,7 (d, <sup>2</sup>J = 9,7, C<sub>4</sub>), 136,6 (d, <sup>2</sup>J = 15,2, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,90 (t, <sup>3</sup>J<sub>H,H</sub> = 7,4, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,42–1,64 (m, 4H, 2×CH<sub>2</sub>), 1,77 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,19–2,61 (m, teljes intenzitás 5H, 2×PCH<sub>2</sub>, NH), 2,78–2,98 (m, 2H, NCH<sub>2</sub>), 5,49 (d, <sup>3</sup>J<sub>P,H</sub> = 33,8, 1H, CH=); [M+H]<sup>+</sup><sub>mért</sub> = 174,1048, C<sub>8</sub>H<sub>17</sub>NOP-re számított: 174,1048.

1-*n*-Butilamino-3-metil-3-foszfolén-1-oxid (31a) [5a]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 63,2; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,6 (CH<sub>3</sub>CH<sub>2</sub>), 19,8 (CH<sub>3</sub>CH<sub>2</sub>), 20,6 (<sup>3</sup>J = 12,1, C<sub>3</sub>-CH<sub>3</sub>), 32,1 (<sup>1</sup>J = 82,0, C<sub>5</sub>), 34,1 (<sup>3</sup>J = 6,2, NCH<sub>2</sub>CH<sub>2</sub>), 35,0 (<sup>1</sup>J = 85,5, C<sub>2</sub>), 40,3 (<sup>2</sup>J = 1,8, NCH<sub>2</sub>), 120,6 (<sup>2</sup>J = 9,7, C<sub>4</sub>), 136,6 (<sup>2</sup>J = 15,2, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,91 (t, <sup>3</sup>J<sub>H,H</sub> = 7,2, 3H, CH<sub>3</sub>CH<sub>2</sub>), 1,28–1,42 (m, 2H, CH<sub>2</sub>), 1,44–1,58 (m, 2H, CH<sub>2</sub>), 1,79 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,12–2,60 (m, 5H, 2×PCH<sub>2</sub>, NH), 2,86–3,00 (m, 2H, NCH<sub>2</sub>), 5,51 (bd, <sup>3</sup>J<sub>P,H</sub> = 33,0, 1H, CH=); [M+H]<sup>+</sup><sub>mért</sub> = 188,1210, C<sub>9</sub>H<sub>19</sub>NOP-re számított: 188,1204.

1-*i*-Butilamino-3-metil-3-foszfolén-1-oxid (31b) [5b]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 63,6; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 19,8 (CH(CH<sub>3</sub>)<sub>2</sub>), 20,6 (<sup>3</sup>J = 12,1, C<sub>3</sub>-CH<sub>3</sub>), 30,0 (<sup>3</sup>J = 6,2, CH), 32,1 (<sup>1</sup>J = 82,0, C<sub>5</sub>), 34,9 (<sup>1</sup>J = 85,5, C<sub>2</sub>), 48,1 (<sup>2</sup>J = 2,0, NCH<sub>2</sub>), 120,6 (<sup>2</sup>J = 9,7, C<sub>4</sub>), 136,6 (<sup>2</sup>J = 15,2, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,89 (d, <sup>3</sup>J<sub>H,H</sub> = 6,7, 6H, CH(CH<sub>3</sub>)<sub>2</sub>), 1,63–1,70 (m, 1H, CH), 1,76 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,22–2,56 (m, 5H, 2×PCH<sub>2</sub>, NH), 2,67–2,74

(m, 2H, NCH<sub>2</sub>), 5,49 (bd, <sup>3</sup>J<sub>P,H</sub> = 33,5, 1H, CH=); [M+H]<sup>+</sup><sub>mért</sub> = 188,1205, C<sub>9</sub>H<sub>19</sub>NOP-re számított: 188,1204.

1-n-Propilamino-3,4-dimetil-3-foszfolén-1-oxid (53h) [4a]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 56,0; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 11,0 (CH<sub>2</sub>CH<sub>3</sub>), 16,3 (d, <sup>3</sup>J = 14,7, C<sub>3</sub>-CH<sub>3</sub>), 25,0 (d, <sup>3</sup>J = 6,2, NCH<sub>2</sub>CH<sub>2</sub>), 37,0 (<sup>1</sup>J = 84,4, C<sub>2</sub>), 42,2 (NCH<sub>2</sub>), 127,5 (<sup>2</sup>J = 11,5, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,92 (t, <sup>3</sup>J<sub>H,H</sub> = 7,3, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,47–1,60 (m, 2H, CH<sub>2</sub>), 1,71 (s, 6H, C<sub>3</sub>-CH<sub>3</sub>), 2,27–2,60 (m, teljes intenzitás 5H, 2×PCH<sub>2</sub>, NH), 2,82–2,95 (m, 2H, NCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 188,1208, C<sub>9</sub>H<sub>19</sub>NOP-re számított: 188,1204.

1-n-Butilamino-3,4-dimetil-3-foszfolén-1-oxid (53a) [4b]<sup>220</sup>

66%; <sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 56,2; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,6 (CH<sub>2</sub>CH<sub>3</sub>), 16,5 (d, <sup>3</sup>J = 14,7, C<sub>3</sub>-CH<sub>3</sub>), 19,8 (CH<sub>2</sub>CH<sub>3</sub>), 34,1 (d, <sup>3</sup>J = 6,2, NCH<sub>2</sub>CH<sub>2</sub>), 37,2 (<sup>1</sup>J = 84,4, C<sub>2</sub>), 40,3 (d, <sup>2</sup>J = 1,6, NCH<sub>2</sub>), 127,7 (<sup>2</sup>J = 11,5, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,91 (t, <sup>3</sup>J<sub>H,H</sub> = 7,2, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,27–1,43 (m, 2H, CH<sub>2</sub>), 1,43–1,57 (m, 2H, CH<sub>2</sub>), 1,71 (s, 6H, C<sub>3</sub>-CH<sub>3</sub>), 2,22–2,62 (m, teljes intenzitás 5H, 2×PCH<sub>2</sub>, NH), 2,85–3,01 (m, 2H, NCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 202,1363, C<sub>10</sub>H<sub>21</sub>NOP-re számított: 202,1361.

1-n-Butilamino-3,4-dimetil-3-foszfolén-1-oxid (53e) [4c]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 56,6; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 16,4 (d, <sup>3</sup>J = 14,8, C<sub>3</sub>-CH<sub>3</sub>), 37,2 (<sup>1</sup>J = 84,0, C<sub>2</sub>), 44,3 (NCH<sub>2</sub>), 127,2 (C<sub>2</sub>\*, C<sub>4</sub>'), 127,7 (d, <sup>2</sup>J = 11,5, C<sub>3</sub>), 128,5 (C<sub>3</sub>')\*, 139,7 (d, <sup>3</sup>J = 6,0, C<sub>1</sub>'), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,70 (s, 6H, C<sub>3</sub>-CH<sub>3</sub>), 2,26–2,63 (m, 4H, 2×PCH<sub>2</sub>), 2,68–2,86 (m, 1H, NH), 4,08–4,22 (m, 2H, NHCH<sub>2</sub>), 7,21–7,38 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 236,1207, C<sub>13</sub>H<sub>19</sub>NOP-re számított: 236,1204.

1-*n*-Hexilamino-3-metil-3-foszfolén-1-oxid (31c) [2a]<sup>217</sup>

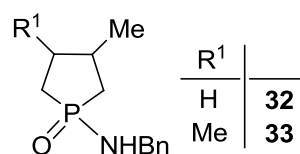
<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 63,1; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,7 (CH<sub>3</sub>CH<sub>2</sub>), 20,4 (<sup>3</sup>J = 12,1, C<sub>3</sub>-CH<sub>3</sub>), 22,3 (CH<sub>3</sub>CH<sub>2</sub>), 26,2 (CH<sub>2</sub>), 31,2 (CH<sub>2</sub>), 31,8 (<sup>3</sup>J = 6,2, CH<sub>2</sub>), 31,9 (<sup>1</sup>J = 82,0, C<sub>5</sub>), 34,8 (<sup>1</sup>J = 85,5, C<sub>2</sub>), 40,4 (NCH<sub>2</sub>), 120,5 (<sup>2</sup>J = 9,6, C<sub>4</sub>), 136,4 (<sup>2</sup>J = 15,2, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,85 (t, J = 6,2, 3H, CH<sub>3</sub>CH<sub>2</sub>), 1,18–1,35 (m, 6H, 3×CH<sub>2</sub>), 1,41–1,55 (m, 2H, CH<sub>2</sub>), 1,76 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,18–2,57 (m, teljes intenzitás 5H, 2×PCH<sub>2</sub>, NH), 2,81–2,96 (m, 2H, NCH<sub>2</sub>), 5,48 (d, J = 33,4, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 216,1527, C<sub>11</sub>H<sub>21</sub>NOP-re számított: 216,1517.

1-*c*-Hexilamino-3-metil-3-foszfolén-1-oxid (31d) [2b]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 60,7; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 20,5 (<sup>3</sup>J = 12,1, C<sub>3</sub>-CH<sub>3</sub>), 24,9 (C<sub>3</sub>'), 25,2 (C<sub>4</sub>'), 33,1 (<sup>1</sup>J = 82,2, C<sub>5</sub>), 36,0 (<sup>1</sup>J = 85,7, C<sub>2</sub>), 36,1 (<sup>3</sup>J = 4,0, C<sub>2</sub>'), 49,9 (C<sub>1</sub>'), 120,5 (<sup>2</sup>J = 9,7, C<sub>4</sub>), 136,4 (<sup>2</sup>J = 15,2, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,02–1,38 (m, 6H, 3×CH<sub>2</sub>), 1,48–2,00 (m, 5H, CH, 2×CH<sub>2</sub>), 1,76 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,15–2,60 (m, 4H PCH<sub>2</sub>), 2,94–3,14 (m, 1H, NH), 5,48 (d, J = 37,1, 1H, CH); [M+H]<sup>+</sup><sub>mért</sub> = 214,1369, C<sub>11</sub>H<sub>21</sub>NOP-re számított: 214,1361.

1-Benzilamino-3-metil-3-foszfolén-1-oxid (31e) [2c]<sup>226</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 63,5; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 20,5 (<sup>3</sup>J = 12,1, C<sub>3</sub>-CH<sub>3</sub>), 32,2 (<sup>1</sup>J = 81,8, C<sub>5</sub>), 35,0 (<sup>1</sup>J = 85,3, C<sub>2</sub>), 44,2 (NCH<sub>2</sub>), 120,6 (<sup>2</sup>J = 9,8, C<sub>4</sub>), 127,3 (C<sub>2</sub>'\*, C<sub>4</sub>'), 128,5 (C<sub>3</sub>'\*), 136,6 (<sup>2</sup>J = 15,3, C<sub>3</sub>), 139,6 (<sup>3</sup>J = 5,8, C<sub>1</sub>'), \* felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,76 (s, 3H, C<sub>3</sub>-CH<sub>3</sub>), 2,18–2,62 (m, 4H, 2×PCH<sub>2</sub>), 3,01–3,16 (m, 1H, NH), 4,08–4,20 (m, 2H, NHCH<sub>2</sub>), 5,51 (d, J = 33,6, 1H, CH), 7,22–7,38 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 222,1051, C<sub>12</sub>H<sub>17</sub>NOP-re számított: 222,1048.

**7. TELÍTETT GYŰRŰS FOSZFINSAV-AMIDOK (32 és 33)****1-Benzilamino-3-metil-foszfolán-1-oxid (32)** [6]<sup>226</sup>

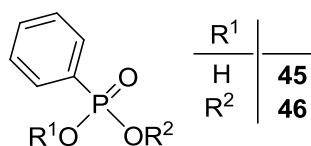
<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 66,1 (50%) és 66,2 (50%); [M+H]<sup>+</sup><sub>mért</sub> = 224,1209, C<sub>12</sub>H<sub>19</sub>NOP-re számított: 224,1204.

**1-Benzilamino-3,4-dimetil-foszfolán-1-oxid (33)** [7]<sup>226</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 59,0 (60%), 65,3 (30%) és 64,8 (10%); [M+H]<sup>+</sup><sub>mért</sub> = 238,1367, C<sub>13</sub>H<sub>21</sub>NOP-re számított: 238,1361.



## 8. FOSZFONÁTOK (45 és 46)

Fenilfoszfonsav-monobutil-észter<sup>207</sup> (**45d**) [3a]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 21,8; [M+H]<sup>+</sup><sub>mért</sub> = 215,0840, C<sub>10</sub>H<sub>16</sub>O<sub>3</sub>P-re számított: 215,0837.

Fenilfoszfonsav-mono-*n*-pentil-észter<sup>208</sup> (**45f**) [3b]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 22,2; [M+H]<sup>+</sup><sub>mért</sub> = 229,0991, C<sub>11</sub>H<sub>18</sub>O<sub>3</sub>P-re számított: 229,0994.

Fenilfoszfonsav-mono-*i*-pentil-észter<sup>208</sup> (**45g**) [3c]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 21,9; [M+H]<sup>+</sup><sub>mért</sub> = 229,0996, C<sub>11</sub>H<sub>18</sub>O<sub>3</sub>P-re számított: 229,0994.

Fenilfoszfonsav-mono-*n*-oktil-észter<sup>209</sup> (**45h**) [3d]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 22,8; [M+H]<sup>+</sup><sub>mért</sub> = 271,1467, C<sub>14</sub>H<sub>24</sub>O<sub>3</sub>P-re számított: 271,1463.

Fenilfoszfonsav-mono-2-etilhexil-észter<sup>210</sup> (**45i**) [3e]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 22,0; [M+H]<sup>+</sup><sub>mért</sub> = 271,1466, C<sub>14</sub>H<sub>24</sub>O<sub>3</sub>P-re számított: 271,1463.

Fenilfoszfonsav-di-*n*-butil-észter<sup>211</sup> (**46d**) [4a]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ<sub>p</sub> 19,5, (δ lit<sup>211</sup> 18,8); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,5 (2×CH<sub>2</sub>CH<sub>3</sub>), 18,7 (2×CH<sub>2</sub>CH<sub>3</sub>), 32,4 (<sup>3</sup>J<sub>PC</sub> = 6,5, 2×OCH<sub>2</sub>CH<sub>2</sub>), 65,8 (<sup>2</sup>J<sub>PC</sub> = 5,7, 2×OCH<sub>2</sub>), 128,3 (<sup>1</sup>J<sub>PC</sub> = 188,2, C<sub>1'</sub>), 128,4 (<sup>3</sup>J<sub>PC</sub> = 15,0, C<sub>3'</sub>)\*, 131,7 (<sup>2</sup>J<sub>PC</sub> = 9,8, C<sub>2'</sub>)\*, 132,3 (<sup>4</sup>J<sub>PC</sub> = 3,0, C<sub>4'</sub>), \*felcserélhető;  
<sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,88 (t, <sup>1</sup>J<sub>H,H</sub> = 7,3, 6H, 2×CH<sub>2</sub>CH<sub>3</sub>), 1,30–1,44 (m, 4H, 2×CH<sub>2</sub>), 1,57–1,70 (m, 4H, 2×CH<sub>2</sub>), 3,91–4,13 (m, 4H, 2×OCH<sub>2</sub>), 7,38–7,84 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 271,1465, C<sub>14</sub>H<sub>24</sub>O<sub>3</sub>P-re számított: 271,1463.

Fenilfoszfonsav-di-*n*-pentil-észter<sup>212</sup> (46f) [4b]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ<sub>p</sub> 18,9, (δ lit<sup>212</sup> 19,0); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,0 (2×CH<sub>2</sub>CH<sub>3</sub>), 22,2 (2×CH<sub>2</sub>CH<sub>3</sub>), 27,7 (2×CH<sub>2</sub>), 30,2 (<sup>3</sup>J<sub>PC</sub> = 6,5, OCH<sub>2</sub>CH<sub>2</sub>), 66,1 (<sup>2</sup>J<sub>PC</sub> = 5,7, OCH<sub>2</sub>), 128,4 (<sup>1</sup>J<sub>PC</sub> = 188,0, C<sub>1'</sub>), 128,5 (<sup>3</sup>J<sub>PC</sub> = 15,0, C<sub>3'</sub>)\*, 131,8 (<sup>2</sup>J<sub>PC</sub> = 9,8, C<sub>2'</sub>)\*, 132,3 (<sup>4</sup>J<sub>PC</sub> = 3,0, C<sub>4'</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,88 (t, <sup>1</sup>J<sub>H,H</sub> = 6,9, 6H, 2×CH<sub>3</sub>), 1,23–1,40 (m, 8H, 4×CH<sub>2</sub>), 1,57–1,75 (m, 4H, 2×CH<sub>2</sub>), 3,92–4,14 (m, 4H, 2×OCH<sub>2</sub>), 7,40–7,88 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 299,1776, C<sub>16</sub>H<sub>28</sub>O<sub>3</sub>P-re számított: 299,1776.

Fenilfoszfonsav-di-*i*-pentil-észter<sup>213</sup> (46g) [4c]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 18,9; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 22,27 (2×CH<sub>2</sub>CH<sub>3</sub>), 22,29 (2×CH<sub>2</sub>CH<sub>3</sub>), 24,5 (2×CH), 39,1 (<sup>3</sup>J<sub>PC</sub> = 6,5, 2×OCH<sub>2</sub>CH<sub>2</sub>), 64,5 (<sup>2</sup>J<sub>PC</sub> = 5,7, 2×OCH<sub>2</sub>), 128,3 (<sup>1</sup>J<sub>PC</sub> = 188,0, C<sub>1'</sub>), 128,4 (<sup>3</sup>J<sub>PC</sub> = 15,0, C<sub>3'</sub>)\*, 131,7 (<sup>2</sup>J<sub>PC</sub> = 9,8, C<sub>2'</sub>)\*, 132,3 (<sup>4</sup>J<sub>PC</sub> = 3,0, C<sub>4'</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,88 (t, <sup>1</sup>J<sub>H,H</sub> = 6,7, 12H, 4×CHCH<sub>3</sub>), 1,50–1,81 (m, 6H, 2×CH, 2×CH<sub>2</sub>), 3,95–4,17 (m, 4H, 2×OCH<sub>2</sub>), 7,40–7,87 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> 299,1780, C<sub>16</sub>H<sub>28</sub>O<sub>3</sub>P-re számított: 299,1776.

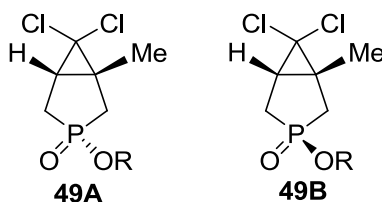
Fenilfoszfonsav-di-*n*-oktil-észter<sup>214</sup> (46h) [4d]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 18,9; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 14,0 (2×CH<sub>2</sub>CH<sub>3</sub>), 22,6 (2×CH<sub>2</sub>CH<sub>3</sub>), 25,5 (2×CH<sub>2</sub>), 29,05 (2×CH<sub>2</sub>), 29,12 (2×CH<sub>2</sub>), 30,4 (<sup>3</sup>J<sub>PC</sub> = 6,5, 2×OCH<sub>2</sub>CH<sub>2</sub>), 31,7 (2×CH<sub>2</sub>), 66,1 (<sup>2</sup>J<sub>PC</sub> = 5,7, 2×OCH<sub>2</sub>), 128,37 (<sup>3</sup>J<sub>PC</sub> = 15,0, C<sub>3'</sub>)\*, 128,41 (<sup>1</sup>J<sub>PC</sub> = 188,3, C<sub>1'</sub>), 131,7 (<sup>2</sup>J<sub>PC</sub> = 9,8, C<sub>2'</sub>)\*, 132,2 (<sup>4</sup>J<sub>PC</sub> = 3,1, C<sub>4'</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,87 (m, 6H, 2×CH<sub>3</sub>), 1,19–1,38 (m, 18H, 9×CH<sub>2</sub>), 1,55–1,72 (m, 6H, 3×CH<sub>2</sub>), 3,92–4,13 (m, 4H, 2×OCH<sub>2</sub>), 7,41–7,87 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> 383,2716, C<sub>22</sub>H<sub>40</sub>O<sub>3</sub>P-re számított: 383,2715.

Fenilfoszfonsav-di-2-ethylhexil-észter<sup>215</sup> (**46i**) [**4e**]<sup>187</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 18,8 (bs); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 10,8 (2×CH<sub>2</sub>CH<sub>3</sub>), 13,9 (2×CH<sub>2</sub>CH<sub>3</sub>), 22,9 (2×CH<sub>2</sub>), 23,3 (2×CH<sub>2</sub>), 28,8 (<sup>4</sup>J<sub>PC</sub> = 3,5, 2×CH<sub>2</sub>), 29,9 (2×CH<sub>2</sub>), 40,08 (<sup>3</sup>J<sub>PC</sub> = 6,9, 2×OCH<sub>2</sub>CH) és 40,10 (<sup>3</sup>J<sub>PC</sub> = 6,9, 2×OCH<sub>2</sub>CH), 67,9 (<sup>2</sup>J<sub>PC</sub> = 6,0, 2×OCH<sub>2</sub>), 128,28 (<sup>3</sup>J<sub>PC</sub> = 14,9, C<sub>3'</sub>)\*, 128,33 (<sup>1</sup>J<sub>PC</sub> = 188,4, C<sub>1'</sub>), 131,7 (<sup>2</sup>J<sub>PC</sub> = 9,6, C<sub>2'</sub>)\*, 132,1 (<sup>4</sup>J<sub>PC</sub> = 3,0, C<sub>4'</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,86 (m, 12H, 4×CH<sub>3</sub>), 1,12–1,60 (m, 18H, 2×CH, 8×CH<sub>2</sub>), 3,81–4,05 (m, 4H, 2×OCH<sub>2</sub>), 7,40–7,87 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> 383,2718, C<sub>22</sub>H<sub>40</sub>O<sub>3</sub>P-re számított: 383,2715.

### 9. 3-ALKOXI-6,6-DIKLÓR-3-FOSZFABICIKLO[3.1.0]HEXÁN-3-OXIDOK (49)



#### 3-Pentoxi-6,6-diklór-3-foszfabiciklo[3.1.0]hexán-3-oxid (49e) [17a]<sup>216</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 81,4 (**A**: 52%) és 85,9 (**B**: 48%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ az **A** izomerre: 9,2 (2×CH<sub>2</sub>CH<sub>3</sub>), 21,6 (<sup>3</sup>J = 7,9, C<sub>1</sub>-CH<sub>3</sub>), 26,9 (<sup>1</sup>J = 91,8, C<sub>4</sub>), 27,37 (<sup>3</sup>J = 3,3) és 27,38 (<sup>3</sup>J = 3,7) CHCH<sub>2</sub>, 32,3 (<sup>2</sup>J = 12,6, C<sub>1</sub>), 32,7 (<sup>1</sup>J = 91,9, C<sub>2</sub>), 32,9 (<sup>2</sup>J = 12,6, C<sub>5</sub>), 71,8 (<sup>3</sup>J = 12,4, C<sub>6</sub>), 80,0 (<sup>2</sup>J = 7,5, OCH); a **B** izomerre: 9,2 (2×CH<sub>2</sub>CH<sub>3</sub>), 21,4 (<sup>3</sup>J = 7,5, C<sub>1</sub>-CH<sub>3</sub>), 25,6 (<sup>1</sup>J = 89,6, C<sub>4</sub>), 27,37 (<sup>3</sup>J = 3,3) és 27,38 (<sup>3</sup>J = 3,7) CHCH<sub>2</sub>, 31,0 (<sup>2</sup>J = 12,7, C<sub>1</sub>), 31,5 (<sup>2</sup>J = 14,8, C<sub>5</sub>), 31,6 (<sup>1</sup>J = 91,4, C<sub>2</sub>), 72,0 (<sup>3</sup>J = 13,8, C<sub>6</sub>), 79,2 (<sup>2</sup>J = 7,2, OCH); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,89–0,98 (m, 6H, 2×CH<sub>2</sub>CH<sub>3</sub>), 1,56 (s, C<sub>1</sub>-CH<sub>3</sub>, **B**) és 1,62 (s, C<sub>1</sub>-CH<sub>3</sub>, **A**) teljes intenzitás 3H, 4,26–4,37 (m, 1H, OCH); [M+H]<sup>+</sup><sub>mért</sub> = 285,0579, C<sub>11</sub>H<sub>19</sub>O<sub>2</sub>P<sup>35</sup>Cl<sub>2</sub>-re számított: 285,0578.

#### 3-Pentoxi-6,6-diklór-3-foszfabiciklo[3.1.0]hexán-3-oxid (49Ae) [17Aa]<sup>216</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 81,4; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 9,3 (2×CH<sub>2</sub>CH<sub>3</sub>), 21,7 (<sup>3</sup>J = 7,9, C<sub>1</sub>-CH<sub>3</sub>), 27,0 (<sup>1</sup>J = 91,8, C<sub>4</sub>), 27,45 (<sup>3</sup>J = 3,5) és 27,47 (<sup>3</sup>J = 3,8) CHCH<sub>2</sub>, 31,6 (<sup>2</sup>J = 14,7, C<sub>1</sub>), 32,8 (<sup>1</sup>J = 91,9, C<sub>2</sub>), 33,0 (<sup>2</sup>J = 12,6, C<sub>5</sub>), 71,9 (<sup>3</sup>J = 12,5, C<sub>6</sub>), 80,0 (<sup>2</sup>J = 7,5, OCH); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,91 (t, J = 7,4, 3H, CH<sub>2</sub>CH<sub>3</sub>), 0,92 (t, J = 7,4, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,61 (s, 3H, C<sub>1</sub>-CH<sub>3</sub>), 4,27–4,40 (m, 1H, OCH).

#### 3-Pentoxi-6,6-diklór-3-foszfabiciklo[3.1.0]hexán-3-oxid (49Be) [17Ba]<sup>216</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 86,0; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 9,2 és 9,3 (CH<sub>2</sub>CH<sub>3</sub>), 21,5 (<sup>3</sup>J = 7,5, C<sub>1</sub>-CH<sub>3</sub>), 25,6 (<sup>1</sup>J = 89,6, C<sub>4</sub>), 27,45 (<sup>3</sup>J = 3,9) és 27,47 (<sup>3</sup>J = 3,2) CHCH<sub>2</sub>, 31,0 (<sup>2</sup>J = 13,0, C<sub>1</sub>), 31,7 (<sup>1</sup>J

= 91,9, C<sub>2</sub>), 32,4 (<sup>2</sup>J = 11,7, C<sub>5</sub>), 72,1 (<sup>3</sup>J = 13,8, C<sub>6</sub>), 79,2 (<sup>2</sup>J = 7,2, OCH); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,92 (t, J = 7,3, 3H, CH<sub>2</sub>CH<sub>3</sub>), 0,94 (t, J = 7,2, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,55 (s, 3H, C<sub>1</sub>-CH<sub>3</sub>), 4,25–4,33 (m, 1H, OCH).

3-Metilbutoxi-6,6-diklór-3-foszfabiciklo[3.1.0]hexán-3-oxid (49f) [17b]<sup>216</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 83,9 (**A**: 52%) és 87,7 (**B**: 48%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ az **A** izomerre: 21,8 (<sup>3</sup>J = 5,8, C<sub>1</sub>-CH<sub>3</sub>), 22,3 (2×CH<sub>3</sub>), 24,5 (CH), 26,5 (<sup>1</sup>J = 91,3, C<sub>4</sub>), 31,8 (<sup>2</sup>J = 14,2, C<sub>1</sub>), 32,3 (<sup>1</sup>J = 91,5, C<sub>2</sub>), 33,1 (<sup>2</sup>J = 12,1, C<sub>5</sub>), 39,1 (<sup>3</sup>J = 5,4, OCH<sub>2</sub>CH<sub>2</sub>), 64,5 (<sup>2</sup>J = 7,2, OCH<sub>2</sub>), 71,6 (<sup>3</sup>J = 10,7, C<sub>6</sub>); a **B** izomerre: 21,6 (<sup>3</sup>J = 7,6, C<sub>1</sub>-CH<sub>3</sub>), 22,3 (2×CH<sub>3</sub>), 24,5 (CH), 24,9 (<sup>1</sup>J = 89,8, C<sub>4</sub>), 30,7 (<sup>1</sup>J = 90,3, C<sub>2</sub>), 31,0 (<sup>2</sup>J = 12,8, C<sub>1</sub>), 32,4 (<sup>2</sup>J = 11,1, C<sub>5</sub>), 39,3 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 63,1 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 71,5 (<sup>3</sup>J = 11,5, C<sub>6</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,92 (d, 3H, J = 4,0) és 0,93 (d, 3H, J = 2,4) CH(CH<sub>3</sub>)<sub>2</sub>, 1,53 (s, C<sub>1</sub>-CH<sub>3</sub>, **B**) és 1,62 (s, C<sub>1</sub>-CH<sub>3</sub>, **A**) teljes intenzitás 3H, 3,92–4,14 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 285,0583, C<sub>11</sub>H<sub>19</sub>O<sub>2</sub>P<sup>35</sup>Cl<sub>2</sub>-re számított: 285,0578.

3-Metilbutoxi-6,6-diklór-3-foszfabiciklo[3.1.0]hexán-3-oxid (49Bf) [17Bb]<sup>216</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 87,7; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 21,5 (<sup>3</sup>J = 7,6, C<sub>1</sub>-CH<sub>3</sub>), 22,28 (CHCH<sub>3</sub>), 22,30 (CHCH<sub>3</sub>), 24,6 (CH), 24,8 (<sup>1</sup>J = 89,4, C<sub>4</sub>), 30,7 (<sup>1</sup>J = 90,3, C<sub>2</sub>), 30,9 (<sup>2</sup>J = 12,9, C<sub>1</sub>), 32,3 (<sup>2</sup>J = 11,1, C<sub>5</sub>), 39,2 (<sup>3</sup>J = 5,9, OCH<sub>2</sub>CH<sub>2</sub>), 63,1 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 72,0 (<sup>3</sup>J = 13,1, C<sub>6</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,92 (d, 6H, J = 6,5, CH(CH<sub>3</sub>)<sub>2</sub>), 1,53 (s, 3H, C<sub>1</sub>-CH<sub>3</sub>), 3,95–4,25 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 285,0583, C<sub>11</sub>H<sub>19</sub>O<sub>2</sub>P<sup>35</sup>Cl<sub>2</sub>-re számított: 285,0578.

n-Oktiloxi-6,6-diklór-3-foszfabiciklo[3.1.0]hexán-3-oxid (49g) [17c]<sup>216</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 83,1 (**A**: 57%), 86,9 (**B**: 43%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ az **A** izomerre: 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 21,8 (<sup>3</sup>J = 8,2, C<sub>1</sub>-CH<sub>3</sub>), 22,5 (CH<sub>2</sub>CH<sub>3</sub>), 25,4 (CH<sub>2</sub>), 26,5 (<sup>1</sup>J = 91,5, C<sub>4</sub>), 29,0 (széles jel [bs]\*, CH<sub>2</sub>), 29,1 (bs\*, CH<sub>2</sub>), 30,5 (<sup>3</sup>J = 9,0, OCH<sub>2</sub>CH<sub>2</sub>), 31,7 (bs\*, CH<sub>2</sub>), 31,8 (<sup>2</sup>J = 15,4, C<sub>1</sub>), 32,3 (<sup>1</sup>J = 89,1, C<sub>2</sub>), 33,1 (<sup>2</sup>J = 12,1, C<sub>5</sub>), 66,0 (<sup>2</sup>J = 7,1, OCH<sub>2</sub>), 71,6 (<sup>3</sup>J = 11,0,

C<sub>6</sub>); a **B** izomerre: 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 21,0 (<sup>3</sup>J = 7,6, C<sub>1</sub>-CH<sub>3</sub>), 22,5 (CH<sub>2</sub>CH<sub>3</sub>), 24,9 (<sup>1</sup>J = 89,8, C<sub>4</sub>), 25,5 (CH<sub>2</sub>), 29,0 (bs\*, CH<sub>2</sub>), 29,1 (bs\*, CH<sub>2</sub>), 30,4 (<sup>3</sup>J = 8,4, OCH<sub>2</sub>CH<sub>2</sub>), 30,7 (<sup>1</sup>J = 90,3, C<sub>2</sub>), 31,0 (<sup>2</sup>J = 12,9, C<sub>1</sub>), 32,3 (<sup>2</sup>J = 11,1, C<sub>5</sub>), 64,6 (<sup>2</sup>J = 6,6, OCH<sub>2</sub>), 72,0 (<sup>3</sup>J = 13,2, C<sub>6</sub>), \*a két izomerre együtt; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,88 (t, 3H, J = 6,8, CH<sub>2</sub>CH<sub>3</sub>), 1,54 (s, C<sub>1</sub>-CH<sub>3</sub>, **B**) és 1,61 (s, C<sub>1</sub>-CH<sub>3</sub>, **A**) teljes intenzitás 3H, 3,93–4,06 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 327,1051, C<sub>14</sub>H<sub>26</sub>O<sub>2</sub>P<sup>35</sup>Cl<sub>2</sub>-re számított: 327,1047.

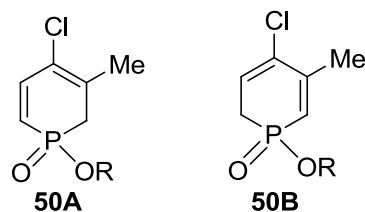
2-Etilhexiloxi-6,6-diklór-3-foszfabiciklo[3.1.0]hexán-3-oxid (49h) [17d]<sup>216</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 83,4 (**A-1**: 49%), 82,3 (**A-2**: 5%), 86,8 (**B-1**: 42%) és 85,6 (**B-2**: 4%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ az **A** izomerre: 10,87 (CHCH<sub>2</sub>CH<sub>3</sub>), 14,0 (CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>), 21,8 (<sup>3</sup>J = 8,2, C<sub>1</sub>-CH<sub>3</sub>), 22,9 (CH<sub>2</sub>), 23,2 (CH<sub>2</sub>), 26,4 (<sup>1</sup>J = 91,5, C<sub>4</sub>), 28,79 (CH<sub>2</sub>), 29,9 (CH<sub>2</sub>), 31,8 (<sup>2</sup>J = 14,2, C<sub>1</sub>), 32,2 (<sup>1</sup>J = 91,7, C<sub>2</sub>), 33,2 (<sup>2</sup>J = 12,1, C<sub>5</sub>), 40,1 (<sup>3</sup>J = 6,2, OCH<sub>2</sub>CH), 68,0 (<sup>2</sup>J = 7,3, OCH<sub>2</sub>), 71,6 (<sup>3</sup>J = 10,5, C<sub>6</sub>); a **B** izomerre: 10,90 (CHCH<sub>2</sub>CH<sub>3</sub>), 14,0 (CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>), 21,5 (<sup>3</sup>J = 7,5, C<sub>1</sub>-CH<sub>3</sub>), 22,9 (CH<sub>2</sub>), 23,3 (CH<sub>2</sub>), 24,6 (<sup>1</sup>J = 88,5, C<sub>4</sub>), 28,83 (CH<sub>2</sub>), 30,0 (CH<sub>2</sub>), 30,6 (<sup>1</sup>J = 91,9, C<sub>2</sub>), 31,0 (<sup>2</sup>J = 12,9, C<sub>1</sub>), 32,3 (<sup>2</sup>J = 11,2, C<sub>5</sub>), 40,1 (<sup>3</sup>J = 6,2, OCH<sub>2</sub>CH), 66,6 (<sup>2</sup>J = 7,9, OCH<sub>2</sub>), 72,0 (<sup>3</sup>J = 13,6, C<sub>6</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,82–0,93 (m, 6H, 2×CH<sub>3</sub>), 1,54 (s, C<sub>1</sub>-CH<sub>3</sub>, **B**) és 1,62 (s, C<sub>1</sub>-CH<sub>3</sub>, **A**) teljes intenzitás 3H, 3,82–3,98 (m, 2H, OCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 327,1049, C<sub>14</sub>H<sub>26</sub>O<sub>2</sub>P<sup>35</sup>Cl<sub>2</sub>-re számított: 327,1047.

n-Dodeciloxi-6,6-diklór-3-foszfabiciklo[3.1.0]hexán-3-oxid (49i) [17e]<sup>216</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 83,0 (**A**: 48%) és 86,8 (**B**: 52%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ az **A** izomerre: 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 21,7 (<sup>3</sup>J = 8,2, C<sub>1</sub>-CH<sub>3</sub>), 22,6 (CH<sub>2</sub>CH<sub>3</sub>), 25,4 (CH<sub>2</sub>), 26,4 (<sup>1</sup>J = 91,5, C<sub>4</sub>), 29,0 (CH<sub>2</sub>), 29,2 (CH<sub>2</sub>), 29,38 (bs\*, CH<sub>2</sub>), 29,42 (bs\*, CH<sub>2</sub>), 29,5 (bs\*, 3×CH<sub>2</sub>), 30,4 (<sup>3</sup>J = 5,5, OCH<sub>2</sub>CH<sub>2</sub>), 31,8 (<sup>2</sup>J = 14,3, C<sub>1</sub>), 32,2 (<sup>1</sup>J = 91,5, C<sub>2</sub>), 33,1 (<sup>2</sup>J = 12,1, C<sub>5</sub>), 66,0 (<sup>2</sup>J = 7,1, OCH<sub>2</sub>), 71,5 (<sup>3</sup>J = 10,9, C<sub>6</sub>); a **B** izomerre: 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 21,5 (<sup>3</sup>J = 7,6, C<sub>1</sub>-CH<sub>3</sub>), 22,6 (CH<sub>2</sub>CH<sub>3</sub>), 25,0 (<sup>1</sup>J = 95,3, C<sub>4</sub>), 25,5 (CH<sub>2</sub>), 29,1 (CH<sub>2</sub>), 29,2 (CH<sub>2</sub>), 29,38 (bs\*, CH<sub>2</sub>), 29,42

(bs\*, CH<sub>2</sub>), 29,5 (bs\*, 3×CH<sub>2</sub>), 30,5 (<sup>3</sup>J = 6,0, OCH<sub>2</sub>CH<sub>2</sub>), 30,6 (<sup>1</sup>J = 90,3, C<sub>2</sub>), 31,0 (<sup>2</sup>J = 12,9, C<sub>1</sub>), 32,3 (<sup>2</sup>J = 11,1, C<sub>5</sub>), 64,6 (<sup>2</sup>J = 6,7, OCH<sub>2</sub>), 72,0 (<sup>3</sup>J = 13,1, C<sub>6</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,85 (t, 3H, J = 6,9, CH<sub>2</sub>CH<sub>3</sub>), 1,51 (s, C<sub>1</sub>-CH<sub>3</sub>, **B**) és 1,58 (s, C<sub>1</sub>-CH<sub>3</sub>, **A**) teljes intenzitás 3H, 3,88–4,09 (m, 2H, OCH<sub>2</sub>), [M+H]<sup>+</sup><sub>mért</sub> = 383,1677, C<sub>18</sub>H<sub>34</sub>O<sub>2</sub>P<sup>35</sup>Cl<sub>2</sub>-re számított: 383,1673.

**10. 3- ÉS 5-METIL-1-ALKOXI-4-KLÓR-1,2-DIHDROFOSZFININ-OXIDOK (50)****3- és 5-Metil-1-pentoxi-4-klór-1,2-dihidrofoszfinin-1-oxid (50e) [18a]<sup>216</sup>**

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 30,9 (A: 75%) és 30,0 (B: 25%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (A): 9,3 (2×CH<sub>3</sub>), 23,4 (<sup>3</sup>J = 10,5, C<sub>3</sub>–CH<sub>3</sub>), 27,8 (<sup>3</sup>J = 3,9) és 27,9 (<sup>3</sup>J = 3,4) CHCH<sub>2</sub>, 34,4 (<sup>1</sup>J = 100,1, C<sub>2</sub>), 79,4 (<sup>2</sup>J = 7,0, OCH), 120,1 (<sup>1</sup>J = 121,6, C<sub>6</sub>), 123,3 (<sup>2</sup>J = 21,8, C<sub>3</sub>), 132,1 (<sup>3</sup>J = 8,8, C<sub>4</sub>), 144,2 (C<sub>5</sub>); a minor izomerre (B): δ = 9,3 (2×CH<sub>3</sub>), 24,7 (<sup>3</sup>J = 14,7, C<sub>5</sub>–CH<sub>3</sub>), 27,8 (<sup>3</sup>J = 3,9) és 27,9 (<sup>3</sup>J = 3,4) CHCH<sub>2</sub>, 28,7 (<sup>1</sup>J = 99,6, C<sub>2</sub>), 72,2 (<sup>2</sup>J = 7,0, OCH), 119,1 (<sup>1</sup>J = 126,5, C<sub>6</sub>), 123,6 (<sup>2</sup>J = 10,2, C<sub>3</sub>), 131,3 (<sup>3</sup>J = 22,4, C<sub>4</sub>), 150,2 (C<sub>5</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,85–0,95 (m, 6H, 2×CH<sub>3</sub>), 1,55–1,70 (m, 4H, CH<sub>2</sub>), 2,02 (s, 2,25H, C<sub>3</sub>–CH<sub>3</sub>, A), 2,12 (s, 0,75H, C<sub>5</sub>–CH<sub>3</sub>, B), 2,63–2,86 (m, 2H, C(2)H<sub>2</sub>), 3,25–4,35 (m, 1H, OCH), 6,07 (dd, <sup>2</sup>J<sub>P,H</sub> = 13,0, <sup>3</sup>J<sub>H,H</sub> = 8,3, C(6)H, A) a B izomer C(6)H jelével átlapolva, teljes intenzitás 1H, 6,22 (dt, <sup>3</sup>J<sub>P,H</sub> = 26,1, <sup>3</sup>J<sub>H,H</sub> = 5,8, 0,25H, C(3)H, B), 6,70 (dd, <sup>3</sup>J<sub>P,H</sub> = 39,5, <sup>3</sup>J<sub>H,H</sub> = 13,1, 0,75H, C(5)H, A); [M+H]<sup>+</sup><sub>mért</sub> = 271,0632, C<sub>11</sub>H<sub>18</sub>ClO<sub>2</sub>P-re számított: 271,0631.

**3- és 5-Metil-(3-metilbutoxi)-4-klór-1,2-dihidrofoszfinin-1-oxid (50f) [18b]<sup>216</sup>**

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 32,1 (A: 76%) és 31,2 (B: 24%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (A): 22,2 (2×CH<sub>3</sub>), 23,3 (<sup>3</sup>J = 10,5, C<sub>3</sub>–CH<sub>3</sub>), 24,4 (CH), 33,4 (<sup>1</sup>J = 99,2, C<sub>2</sub>), 39,2 (<sup>3</sup>J = 5,9, OCH<sub>2</sub>CH<sub>2</sub>), 63,1 (<sup>2</sup>J = 6,4, OCH<sub>2</sub>), 118,9 (<sup>1</sup>J = 120,8, C<sub>6</sub>), 123,2 (<sup>2</sup>J = 21,6, C<sub>3</sub>), 132,0 (<sup>3</sup>J = 8,7, C<sub>4</sub>), 144,7 (C<sub>5</sub>); a minor izomerre (B): δ 22,2 (2×CH<sub>3</sub>), 24,4 (CH), 24,7 (<sup>3</sup>J = 14,7, C<sub>5</sub>–CH<sub>3</sub>), 27,8 (<sup>1</sup>J = 98,8, C<sub>2</sub>), 39,2 (<sup>3</sup>J = 5,9, OCH<sub>2</sub>CH<sub>2</sub>), 62,9 (<sup>2</sup>J = 6,5, OCH<sub>2</sub>), 118,1 (<sup>1</sup>J = 125,8, C<sub>6</sub>), 123,4 (<sup>2</sup>J = 9,7, C<sub>3</sub>), 131,3 (<sup>3</sup>J = 22,6, C<sub>4</sub>), 150,8 (C<sub>5</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,91 (d,



$^3J_{\text{H,H}} = 6,3$ , 6H,  $\text{CH}(\text{CH}_3)_2$ , 2,03 (s, 2,28H,  $\text{C}_3\text{-CH}_3$ , **A**), 2,13 (s, 0,72H,  $\text{C}_5\text{-CH}_3$ , **B**), 2,58–2,90 (m, 2H,  $\text{C}(2)\text{H}_2$ ), 3,93–4,18 (m, 2H,  $\text{OCH}_2$ ), 6,07 (dd,  $^2J_{\text{P,H}} = 13,1$ ,  $^3J_{\text{H,H}} = 8,4$ , C(6)H, **A**) a **B** izomer C(6)H jelével átlapolva, teljes intenzitás 1H, 6,22 (dt,  $^3J_{\text{P,H}} = 26,3$ ,  $^3J_{\text{H,H}} = 5,4$ , 0,24H, C(3)H, **B**), 6,73 (dd,  $^3J_{\text{P,H}} = 39,6$ ,  $^3J_{\text{H,H}} = 13,1$ , 0,76H, C(5)H, **A**);  $[\text{M}+\text{H}]^+_{\text{mért}} = 271,0634$ ,  $\text{C}_{11}\text{H}_{18}\text{ClO}_2\text{P}$ -re számított: 271,0631.

3- és 5-Metil-1-oktiloxi-4-klór-1,2-dihidrofoszfinin-1-oxid (50g) [18c]<sup>216</sup>

$^{31}\text{P}$  NMR ( $\text{CDCl}_3$ )  $\delta$  32,1 (**A**: 76%) és 31,2 (**B**: 24%);  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ )  $\delta$  a major izomerre (**A**): 14,0 ( $\text{CH}_2\text{CH}_3$ ), 22,6 ( $\text{CH}_2\text{CH}_3$ ), 23,4 ( $^3J = 10,5$ ,  $\text{C}_3\text{-CH}_3$ ), 25,5 ( $\text{CH}_2$ ), 29,0 ( $\text{CH}_2$ ), 29,1 ( $\text{CH}_2$ ), 30,6 ( $^3J = 5,9$ ,  $\text{OCH}_2\text{CH}_2$ ), 31,7 ( $\text{CH}_2$ ), 33,5 ( $^1J = 99,3$ ,  $\text{C}_2$ ), 64,8 ( $^2J = 6,5$ ,  $\text{OCH}_2$ ), 119,0 ( $^1J = 120,9$ ,  $\text{C}_6$ ), 123,4 ( $^2J = 21,9$ ,  $\text{C}_3$ ), 132,1 ( $^3J = 8,7$ ,  $\text{C}_4$ ), 144,9 ( $\text{C}_5$ ); a minor izomerre (**B**):  $\delta$  14,0 ( $\text{CH}_2\text{CH}_3$ ), 22,6 ( $\text{CH}_2\text{CH}_3$ ), 24,9 ( $^3J = 14,8$ ,  $\text{C}_5\text{-CH}_3$ ), 25,5 ( $\text{CH}_2$ ), 27,9 ( $^1J = 98,9$ ,  $\text{C}_2$ ), 29,0 ( $\text{CH}_2$ ), 29,1 ( $\text{CH}_2$ ), 30,6 ( $^3J = 5,9$ ,  $\text{OCH}_2\text{CH}_2$ ), 31,7 ( $\text{CH}_2$ ), 64,7 ( $^2J = 6,5$ ,  $\text{OCH}_2$ ), 118,3 ( $^1J = 125,9$ ,  $\text{C}_6$ ), 123,5 ( $^2J = 10,2$ ,  $\text{C}_3$ ), 131,4 ( $^3J = 22,5$ ,  $\text{C}_4$ ), 150,9 ( $\text{C}_5$ );  $^1\text{H}$  NMR ( $\text{CDCl}_3$ )  $\delta$  0,85 (t, 3H,  $J = 6,6$ ,  $\text{CH}_2\text{CH}_3$ ), 2,01 (s, 2,28H,  $\text{C}_3\text{-CH}_3$ , **A**), 2,11 (s, 0,72H,  $\text{C}_5\text{-CH}_3$ , **B**), 2,58–2,88 (m, 2H,  $\text{C}(2)\text{H}_2$ ), 3,88–4,07 (m, 2H,  $\text{OCH}_2$ ), 6,05 (dd,  $^2J_{\text{P,H}} = 13,4$ ,  $^3J_{\text{H,H}} = 6,1$ , C(6)H, **A**) a **B** izomer C(6)H jelével fedésben, teljes intenzitás 1H, 6,20 (dt,  $^3J_{\text{P,H}} = 26,4$ ,  $^3J_{\text{H,H}} = 5,4$ , 0,24H, C(3)H, **B**), 6,71 (dd,  $^3J_{\text{P,H}} = 39,5$ ,  $^3J_{\text{H,H}} = 13,1$ , 0,76H, C(5)H, **A**);  $[\text{M}+\text{H}]^+_{\text{mért}} = 291,1285$ ,  $\text{C}_{14}\text{H}_{25}\text{O}_2\text{ClP}$ -re számított: 291,1281.

3- és 5-Metil-(2-etilhexiloxi)-4-klór-1,2-dihidrofoszfinin-1-oxid (50h) [18d]<sup>216</sup>

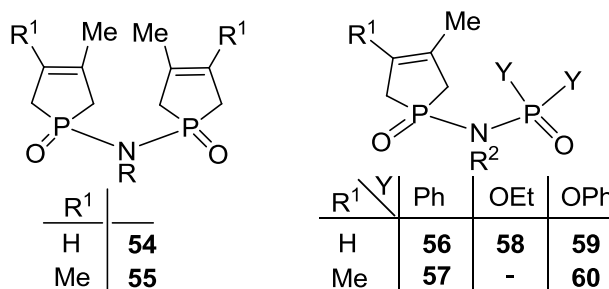
$^{31}\text{P}$  NMR ( $\text{CDCl}_3$ )  $\delta$  32,0 (**A**: 76%) és 31,1 (**B**: 24%);  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ )  $\delta$  a major izomerre (**A**): 10,9 ( $\text{CHCH}_2\text{CH}_3$ ), 14,0 ( $\text{CH}_2\text{CH}_2\text{CH}_3$ ), 22,9 ( $\text{CH}_2$ ), 23,3 (bs\*,  $\text{CH}_2$ ), 23,5 ( $^3J = 10,5$ ,  $\text{C}_3\text{-CH}_3$ ), 28,8 (bs, <sup>a</sup>  $\text{CH}_2$ ), 29,9 (bs, <sup>b</sup>  $\text{CH}_2$ ), 33,5 ( $^1J = 99,5$ ,  $\text{C}_2$ ), 40,2 ( $^3J = 6,4$ ,  $\text{OCH}_2\text{CH}$ ), 66,86 ( $^2J = 6,7$ )<sup>c</sup> és 66,89 ( $^2J = 6,9$ )<sup>c</sup>  $\text{OCH}_2$ , 119,0 ( $^1J = 120,8$ ,  $\text{C}_6$ ), 123,5 ( $^2J = 22,0$ ,  $\text{C}_3$ ), 132,1 ( $^3J = 8,9$ ,  $\text{C}_4$ ), 144,9 ( $\text{C}_5$ ); a minor izomerre (**B**):  $\delta$  10,9 ( $\text{CHCH}_2\text{CH}_3$ ), 14,0

(CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>), 22,9 (CH<sub>2</sub>), 23,3 (bs,<sup>d</sup> CH<sub>2</sub>), 24,9 (<sup>3</sup>J = 14,7, C<sub>5</sub>-CH<sub>3</sub>), 27,9 (<sup>1</sup>J = 98,9, C<sub>2</sub>), 28,8 (bs,<sup>a</sup> CH<sub>2</sub>), 29,9 (bs,<sup>b</sup> CH<sub>2</sub>), 40,2 (<sup>3</sup>J = 6,4, OCH<sub>2</sub>CH), 66,73 (<sup>2</sup>J = 4,4)<sup>e</sup> és 66,75 (<sup>2</sup>J = 3,7)<sup>e</sup> OCH<sub>2</sub>, 118,3 (<sup>1</sup>J = 125,2, C<sub>6</sub>), 123,6 (<sup>2</sup>J = 9,8, C<sub>3</sub>), 131,3 (<sup>3</sup>J = 22,5, C<sub>4</sub>), 150,9 (C<sub>5</sub>)<sup>a-c</sup> valószínűleg két rotamerhez tartozó jelek; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,86–0,92 (m, 6H, 2×CH<sub>2</sub>CH<sub>3</sub>), 2,03 (s, 2,28H, C<sub>3</sub>-CH<sub>3</sub>, **A**), 2,14 (s, 0,72H, C<sub>5</sub>-CH<sub>3</sub>, **B**), 2,60–2,86 (m, 2H, C(2)H<sub>2</sub>), 3,84–3,96 (m, 2H, OCH<sub>2</sub>), 6,08 (dd, <sup>2</sup>J<sub>P,H</sub> = 13,1, <sup>3</sup>J<sub>H,H</sub> = 8,5, C(6)H, **A**) a **B** izomer C(6)H jelével fedésben, teljes intenzitás 1H, 6,23 (dt, <sup>3</sup>J<sub>P,H</sub> = 26,1, <sup>3</sup>J<sub>H,H</sub> = 6,0, 0,24H, C(3)H, **B**), 6,73 (dd, <sup>3</sup>J<sub>P,H</sub> = 39,4, <sup>3</sup>J<sub>H,H</sub> = 13,1, 0,76H, C(5)H, **A**); [M+H]<sup>+</sup><sub>mért</sub> = 291,1291, C<sub>14</sub>H<sub>25</sub>O<sub>2</sub>ClP-re számított: 291,1281.

3- és 5-Metil-1-dodeciloxi-4-klór-1,2-dihidrofoszfinin-1-oxid (50i) [18e]<sup>216</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 32,1 (**A**: 76%) és 31,2 (**B**: 24%); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ a major izomerre (**A**): 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 22,5 (CH<sub>2</sub>CH<sub>3</sub>), 23,4 (<sup>3</sup>J = 10,6, C<sub>3</sub>-CH<sub>3</sub>), 25,4 (CH<sub>2</sub>), 29,1 (CH<sub>2</sub>), 29,3 (CH<sub>2</sub>), 29,4 (CH<sub>2</sub>), 29,5 (CH<sub>2</sub>), 29,6 (2×CH<sub>2</sub>), 30,6 (<sup>3</sup>J = 5,9, OCH<sub>2</sub>CH<sub>2</sub>), 31,8 (CH<sub>2</sub>), 33,5 (<sup>1</sup>J = 99,3, C<sub>2</sub>), 64,8 (<sup>2</sup>J = 6,5, OCH<sub>2</sub>), 119,0 (<sup>1</sup>J = 121,0, C<sub>6</sub>), 123,4 (<sup>2</sup>J = 21,8, C<sub>3</sub>), 132,1 (<sup>3</sup>J = 8,7, C<sub>4</sub>), 144,9 (C<sub>5</sub>); a minor izomerre (**B**): δ = 14,0 (CH<sub>2</sub>CH<sub>3</sub>), 22,6 (CH<sub>2</sub>CH<sub>3</sub>), 24,8 (<sup>3</sup>J = 14,8, C<sub>5</sub>-CH<sub>3</sub>), 25,4 (CH<sub>2</sub>), 27,9 (<sup>1</sup>J = 98,8, C<sub>2</sub>), 29,1 (CH<sub>2</sub>), 29,3 (CH<sub>2</sub>), 29,4 (CH<sub>2</sub>), 29,5 (CH<sub>2</sub>), 29,6 (2×CH<sub>2</sub>), 30,6 (<sup>3</sup>J = 5,9, OCH<sub>2</sub>CH<sub>2</sub>), 31,8 (CH<sub>2</sub>), 64,7 (<sup>2</sup>J = 6,5, OCH<sub>2</sub>), 118,3 (<sup>1</sup>J = 126,0, C<sub>6</sub>), 123,5 (<sup>2</sup>J = 10,1, C<sub>3</sub>), 131,4 (<sup>3</sup>J = 22,6, C<sub>4</sub>), 150,9 (C<sub>5</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,88 (t, <sup>3</sup>J<sub>H,H</sub> = 7,1, 3H, CH<sub>2</sub>CH<sub>3</sub>), 2,03 (s, 2,28H, C<sub>3</sub>-CH<sub>3</sub>, **A**), (s, 0,72H, C<sub>5</sub>-CH<sub>3</sub>, **B**), 2,57–2,87 (m, 2H, C(2)H<sub>2</sub>), 3,93–4,06 (m, 2H, OCH<sub>2</sub>), 6,07 (dd, <sup>2</sup>J<sub>P,H</sub> = 13,2, <sup>3</sup>J<sub>H,H</sub> = 8,4, C(6)H, **A**) a **B** izomer C(6)H jelével fedésben, teljes intenzitás 1H, 6,22 (dt, <sup>3</sup>J<sub>P,H</sub> = 26,1, <sup>3</sup>J<sub>H,H</sub> = 5,5, 0,24H, C(3)H, **B**), 6,72 (dd, <sup>3</sup>J<sub>P,H</sub> = 39,5, <sup>3</sup>J<sub>H,H</sub> = 13,1, 0,76H, C(5)H, **A**), teljes intenzitás 1H; [M+H]<sup>+</sup><sub>mért</sub> = 347,1910, C<sub>18</sub>H<sub>33</sub>O<sub>2</sub>ClP-re számított: 347,1907.

## 11. KÉTSZERESEN FOSZFORILEZETT AMINOK (54–60)

*n*-Butilbisz(3-metil-2,5-dihidro-1*H*-foszfol-1-il)amin-*P,P'*-dioxid (54a) [6a]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>): δ 66,97 és 66,99; <sup>13</sup>C NMR (CDCl<sub>3</sub>) {<sup>1</sup>H, <sup>31</sup>P}: δ 13,9 (CH<sub>3</sub>CH<sub>2</sub>), 20,4 (CH<sub>3</sub>CH<sub>2</sub>), 20,8 (C<sub>3</sub>-CH<sub>3</sub>), 34,2 (NCH<sub>2</sub>CH<sub>2</sub>), 34,55 és 34,61 (C<sub>2</sub>), 37,27 és 37,32 (C<sub>5</sub>), 44,2 (NCH<sub>2</sub>), 120,76 és 120,80 (C<sub>4</sub>), 136,88 és 136,92 (C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,90 (t, <sup>3</sup>J<sub>H,H</sub> = 7,4, 3H, CH<sub>3</sub>CH<sub>2</sub>), 1,21–1,32 (m, 2H, CH<sub>2</sub>), 1,58–1,70 (m, 2H, CH<sub>2</sub>), 1,81 (s, 6H, 2×C<sub>3</sub>-CH<sub>3</sub>), 2,41–2,79 (m, 8H, 4×PCH<sub>2</sub>), 3,04–3,15 (m, 2H, NCH<sub>2</sub>), 5,57 (bd, <sup>3</sup>J<sub>P,H</sub> = 35,9, 2H, 2×CH=); [M+H]<sup>+</sup><sub>mért</sub> = 302,1448, C<sub>14</sub>H<sub>26</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 302,1439.

*i*-Butilbisz(3-metil-2,5-dihidro-1*H*-foszfol-1-il)amin-*P,P'*-dioxid (54b) [6b]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 67,04 és 67,07; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 19,7 (CH(CH<sub>3</sub>)<sub>2</sub>), 20,4 (m, <sup>3</sup>J = 13, C<sub>3</sub>-CH<sub>3</sub>), 29,1 (CH), 34,25 (<sup>1</sup>J = 80,1) és 34,34 (<sup>1</sup>J = 80,2) C<sub>5</sub>, 36,98 (<sup>1</sup>J = 83,8) és 37,07 (<sup>1</sup>J = 83,8) C<sub>2</sub>, 50,7 (NCH<sub>2</sub>), 120,3 (m, <sup>2</sup>J = 11, C<sub>4</sub>), 136,3 (m, <sup>2</sup>J = 16, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,93 (d, <sup>3</sup>J<sub>H,H</sub> = 6,7, 6H, (CH<sub>3</sub>)<sub>2</sub>CH), 1,81 (s, 6H, 2×C<sub>3</sub>-CH<sub>3</sub>), 1,90–2,02 (m, 1H, CH), 2,35–2,84 (m, 8H, 4×PCH<sub>2</sub>), 2,93–3,08 (m, 2H, NCH<sub>2</sub>), 5,57 (bd, <sup>3</sup>J<sub>P,H</sub> = 36,0, 2H, 2×CH=); [M+H]<sup>+</sup><sub>mért</sub> = 302,1447 C<sub>14</sub>H<sub>26</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 302,1439.

*n*-Hexilbisz(3-metil-2,5-dihidro-1*H*-foszfol-1-il)amin-*P,P'*-dioxid (54c) [6c]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 66,67 és 66,68; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,7 (CH<sub>3</sub>CH<sub>2</sub>), 20,4 (m, C<sub>3</sub>-CH<sub>3</sub>), 22,3 (CH<sub>3</sub>CH<sub>2</sub>), 26,4 (N(CH<sub>2</sub>)<sub>3</sub>CH<sub>2</sub>), 31,0 (N(CH<sub>2</sub>)<sub>2</sub>CH<sub>2</sub>), 31,6 (NCH<sub>2</sub>CH<sub>2</sub>), 34,16 (d, <sup>1</sup>J = 80,0) és 34,20 (d, <sup>1</sup>J = 80,0) C<sub>5</sub>, 36,87 (d, <sup>1</sup>J = 83,6) és 36,91 (d, <sup>1</sup>J = 83,6) C<sub>2</sub>, 44,0 (NCH<sub>2</sub>),

120,4 (m, C<sub>4</sub>), 136,5 (m, C<sub>3</sub>), <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,86 (t, <sup>3</sup>J<sub>H,H</sub> = 6,6, 3H, CH<sub>3</sub>CH<sub>2</sub>), 1,20–1,29 (m, 6H, CH<sub>2</sub>), 1,56–1,72 (m, 2H, CH<sub>2</sub>), 1,81 (s, 6H, 2×C<sub>3</sub>–CH<sub>3</sub>), 2,36–2,81 (m, 8H, 4×PCH<sub>2</sub>), 2,98–3,18 (m, 2H, NCH<sub>2</sub>), 5,57 (bd, <sup>3</sup>J<sub>P,H</sub> = 35,9, 2H, 2×CH=); [M+Na]<sup>+</sup><sub>mért</sub> = 352,1573, C<sub>16</sub>H<sub>29</sub>NO<sub>2</sub>NaP<sub>2</sub>-re számított: 352,1571.

*c*-Hexilbisz(3-metil-2,5-dihidro-1*H*-foszfol-1-il)amin-*P,P'*-dioxid (54d) [6d]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 64,6; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 20,6 (m, C<sub>3</sub>–CH<sub>3</sub>), 24,8 (C<sub>4</sub><sup>''</sup>), 27,0 (C<sub>3</sub><sup>''</sup>), 33,1 (t, <sup>3</sup>J = 7,3, C<sub>2</sub><sup>''</sup>), 35,3 (d, <sup>1</sup>J = 78,5, C<sub>5</sub>), 37,9 (d, <sup>1</sup>J = 78,5, C<sub>2</sub>), 58,4 (C<sub>1</sub><sup>''</sup>), 120,6 (m, C<sub>4</sub>), 136,7 (m, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,01–1,34 (m, 4H, CH<sub>2</sub>), 1,70–1,85, 1,81 (s, C<sub>3</sub>–CH<sub>3</sub>) és 1,70–1,85 (m, CH<sub>2</sub>) részben átfedve, teljes intenzitás 10H, 2,30–2,88 (m, 11H, 4×PCH<sub>2</sub>, NCH, CH<sub>2</sub>), 5,56 (bd, <sup>3</sup>J<sub>P,H</sub> = 36,5, 2H, 2×CH=); [M+H]<sup>+</sup><sub>mért</sub> = 328,1606, C<sub>16</sub>H<sub>28</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 328,1595.

Benzilbisz(3-metil-2,5-dihidro-1*H*-foszfol-1-il)amin-*P,P'*-dioxid (54e) [6e]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 68,85 és 68,87; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 20,4 (m, <sup>3</sup>J = 13, C<sub>3</sub>–CH<sub>3</sub>), 33,94 (<sup>1</sup>J = 79,5) és 33,97 (<sup>1</sup>J = 79,4) C<sub>5</sub>, 36,66 (<sup>1</sup>J = 83,1) és 36,70 (<sup>1</sup>J = 83,1) C<sub>2</sub>, 46,18 (NCH<sub>2</sub>), 120,43 és 120,50 (m, <sup>2</sup>J = 11, C<sub>4</sub>), 126,5 (C<sub>2</sub><sup>''</sup>)\*, 127,5 (C<sub>4</sub><sup>''</sup>), 128,6 (C<sub>3</sub><sup>''</sup>)\*, 136,6 (m, <sup>2</sup>J = 17, C<sub>3</sub>), 138,0 (C<sub>1</sub><sup>''</sup>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,76 (s, 6H, 2×C<sub>3</sub>–CH<sub>3</sub>), 2,40–2,82 (m, 8H, 4×PCH<sub>2</sub>), 4,30–4,63 (m, 2H, NCH<sub>2</sub>), 5,55 (bd, <sup>3</sup>J<sub>P,H</sub> = 36,3, 2H, 2×CH=), 7,24–7,38 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 336,1288, C<sub>17</sub>H<sub>24</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 336,1282.

Bisz(3-metil-2,5-dihidro-1*H*-foszfol-1-il)feniletilamin-*P,P'*-dioxid (54f) [6f]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 67,6; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 20,3 (m, <sup>3</sup>J = 13, C<sub>3</sub>–CH<sub>3</sub>), 34,18 (<sup>1</sup>J = 79,6) és 34,21 (<sup>1</sup>J = 79,5) C<sub>5</sub>, 36,82 (<sup>1</sup>J = 83,4) és 36,86 (<sup>1</sup>J = 83,3) C<sub>2</sub>, 38,0 (NCH<sub>2</sub>CH<sub>2</sub>), 45,5 (NCH<sub>2</sub>), 120,37 és 120,41 (m, <sup>2</sup>J = 11, C<sub>4</sub>), 126,6 (C<sub>4</sub><sup>''</sup>), 128,5 (C<sub>2</sub><sup>''</sup>)\*, 128,7 (C<sub>3</sub><sup>''</sup>)\*, 136,45 és 136,49 (m, <sup>2</sup>J = 16, C<sub>3</sub>), 138,0 (C<sub>1</sub><sup>''</sup>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,81 (s, 6H, 2×C<sub>3</sub>–

CH<sub>3</sub>), 2,36–2,78 (m, 8H, 4×PCH<sub>2</sub>), 2,94–3,04 (m, 2H, NCH<sub>2</sub>CH<sub>2</sub>), 3,18–3,42 (m, 2H, NCH<sub>2</sub>), 5,57 (bd, <sup>3</sup>J<sub>P,H</sub> = 36,2, 2H, 2×CH=), 7,13–7,34 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 350,1447, C<sub>18</sub>H<sub>26</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 350,1439.

Bisz(3-metil-2,5-dihidro-1H-foszfol-1-il)fenilamin-*P,P'*-dioxid (54g) [6g]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 65,8; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 20,2 (m, <sup>3</sup>J = 13, C<sub>3</sub>–CH<sub>3</sub>), 33, 4 (<sup>1</sup>J = 82,2) C<sub>5</sub>, 36,1 (<sup>1</sup>J = 85,9) C<sub>2</sub>, 120,3 (m, <sup>2</sup>J = 12, C<sub>4</sub>), 128,3 (bs, C<sub>4</sub><sup>''</sup>), 128,8 (t, <sup>3</sup>J = 3,0, C<sub>2</sub><sup>''</sup>), 130,0 (bs, C<sub>3</sub><sup>''</sup>), 136,4 (m, <sup>2</sup>J = 18, C<sub>3</sub>), 139,1(bs, C<sub>1</sub><sup>''</sup>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,66 (s, 6H, 2×C<sub>3</sub>–CH<sub>3</sub>), 2,42–2,82 (m, 8H, 4×PCH<sub>2</sub>), 5,40 (bd, <sup>3</sup>J<sub>P,H</sub> = 34,9, 2H, 2×CH=), 7,29–7,44 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 322,1130, C<sub>16</sub>H<sub>22</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 322,1126.

*n*-Butilbisz(3,4-dimetil-2,5-dihidro-1H-foszfol-1-il)amin-*P,P'*-dioxid (55a) [7a]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 59,7; <sup>13</sup>C NMR (CDCl<sub>3</sub>) {<sup>1</sup>H, <sup>31</sup>P}: δ 13,8 (CH<sub>3</sub>CH<sub>2</sub>), 16,7 (C<sub>3</sub>–CH<sub>3</sub>), 20,4 (CH<sub>3</sub>CH<sub>2</sub>), 34,2 (NCH<sub>2</sub>CH<sub>2</sub>), 39,3 (C<sub>2</sub>), 44,4 (NCH<sub>2</sub>), 128,0 (C<sub>3</sub>); <sup>13</sup>C NMR (176 MHz, CDCl<sub>3</sub>) {<sup>1</sup>H}: δ 13,8 (CH<sub>3</sub>CH<sub>2</sub>), 16,7 (m, C<sub>3</sub>–CH<sub>3</sub>), 20,4 (CH<sub>3</sub>CH<sub>2</sub>), 34,2 (NCH<sub>2</sub>CH<sub>2</sub>), 39,3 (d, <sup>1</sup>J = 82,5) C<sub>2</sub>, 44,4 (NCH<sub>2</sub>), 128,0 (m, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,89 (t, <sup>3</sup>J<sub>H,H</sub> = 7,4, 3H, CH<sub>3</sub>CH<sub>2</sub>), 1,19–1,34 (m, 2H, CH<sub>2</sub>), 1,55–1,66 (m, 2H, CH<sub>2</sub>), 1,72 (s, 12H, 2×C<sub>3</sub>–CH<sub>3</sub>, 2×C<sub>4</sub>–CH<sub>3</sub>), 2,42–2,82 (m, 8H, 4×PCH<sub>2</sub>), 3,00–3,17 (m, 2H, NCH<sub>2</sub>); [M+H]<sup>+</sup><sub>mért</sub> = 330,1751, C<sub>16</sub>H<sub>30</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 330,1752.

Benzilbisz(3,4-dimetil-2,5-dihidro-1H-foszfol-1-il)amin-*P,P'*-dioxid (55e) [7e]<sup>217</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 62,2; <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 16,4 (m, <sup>3</sup>J = 16, C<sub>3</sub>–CH<sub>3</sub>), 38,8 (<sup>1</sup>J = 81,9) C<sub>2</sub>, 46,5 (NCH<sub>2</sub>), 126,5 (C<sub>2</sub><sup>''</sup>)\*, 127,5 (C<sub>4</sub><sup>''</sup>), 127,8 (m, C<sub>3</sub>), 128,7 (C<sub>3</sub><sup>''</sup>)\*, 138,2 (C<sub>1</sub><sup>''</sup>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,68 (s, 12H, 4×C<sub>3</sub>–CH<sub>3</sub>), 2,36–2,78 (m, 8H, 4×PCH<sub>2</sub>), 4,38–4,52 (m, 2H, NCH<sub>2</sub>), 7,23–7,38 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 364,1605, C<sub>19</sub>H<sub>28</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 364,1595.

Difenilfoszfinoil-1-*n*-propilamino-3-metil-2,5-dihidro-1*H*-foszfol-1-oxid (56h) [9a]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 32,0 (d, <sup>2</sup>*J* = 7,2), 65,9 (d, <sup>2</sup>*J* = 7,2); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 10,9 (CH<sub>2</sub>CH<sub>3</sub>), 20,5 (d, <sup>3</sup>*J* = 12,8, C<sub>3</sub>–CH<sub>3</sub>), 24,2 (CH<sub>2</sub>CH<sub>3</sub>), 35,6 (<sup>1</sup>*J* = 80,5, C<sub>5</sub>), 38,3 (<sup>1</sup>*J* = 84,1, C<sub>2</sub>), 47,3 (NCH<sub>2</sub>), 120,1 (<sup>2</sup>*J* = 10,4, C<sub>4</sub>), 128,6 (d, <sup>3</sup>*J* = 13,1, C<sub>3'</sub>), 131,4 (d, <sup>1</sup>*J* = 124,4, C<sub>1'</sub>), 132,0 (bd, <sup>2</sup>*J* = 10,5, C<sub>2'</sub>), 132,5 (d, <sup>4</sup>*J* = 2,2, C<sub>4'</sub>), 136,1 (<sup>2</sup>*J* = 16,4, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,51 (t, <sup>3</sup>*J*<sub>H,H</sub> = 7,3, 3H, CH<sub>3</sub>CH<sub>2</sub>), 1,18–1,28 (m, 2H, CH<sub>2</sub>), 1,78 (s, 3H, C<sub>3</sub>–CH<sub>3</sub>), 2,23–2,53 (m, 2H, PCH<sub>2</sub>), 2,82–2,98 (m, 2H, PCH<sub>2</sub>), 3,11–3,28 (m, 2H, NCH<sub>2</sub>), 5,52 (d, <sup>3</sup>*J*<sub>P,H</sub> = 36,1, 1H, CH), 7,43–7,63 és 7,70–7,83 (m, 10H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 374,1424, C<sub>20</sub>H<sub>25</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 374,1433.

Difenilfoszfinoil-1-*n*-butilamino-3-metil-2,5-dihidro-1*H*-foszfol-1-oxid (56a) [9b]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 32,0 (d, <sup>2</sup>*J* = 7,3), 65,8 (d, <sup>2</sup>*J* = 7,3); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,1 (CH<sub>2</sub>CH<sub>3</sub>), 19,6 (CH<sub>2</sub>CH<sub>3</sub>), 20,4 (d, <sup>3</sup>*J* = 12,9, C<sub>3</sub>–CH<sub>3</sub>), 32,7 (NCH<sub>2</sub>CH<sub>2</sub>), 35,5 (<sup>1</sup>*J* = 80,5, C<sub>5</sub>), 38,2 (<sup>1</sup>*J* = 84,2, C<sub>2</sub>), 45,4 (NCH<sub>2</sub>), 120,0 (<sup>2</sup>*J* = 10,5, C<sub>4</sub>), 128,5 (d, <sup>3</sup>*J* = 13,1, C<sub>3'</sub>), 131,3 (d, <sup>1</sup>*J* = 124,3, C<sub>1'</sub>), 131,9 (bd, <sup>2</sup>*J* = 10,5, C<sub>2'</sub>), 132,4 (d, <sup>4</sup>*J* = 1,8, C<sub>4'</sub>), 135,7 (<sup>2</sup>*J* = 16,3, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,58 (t, <sup>3</sup>*J*<sub>H,H</sub> = 7,3, 3H, CH<sub>2</sub>CH<sub>3</sub>), 0,87–0,98 (m, 2H, CH<sub>2</sub>), 1,15–1,24 (m, 2H, CH<sub>2</sub>), 1,79 (s, 3H, C<sub>3</sub>–CH<sub>3</sub>), 2,27–2,51 (m, 2H, PCH<sub>2</sub>), 2,85–2,97 (m, 2H, PCH<sub>2</sub>), 3,18–3,29 (m, 2H, NCH<sub>2</sub>), 5,53 (d, <sup>3</sup>*J*<sub>P,H</sub> = 36,0, 1H, CH=), 7,45–7,63 és 7,72–7,81 (m, 10H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 388,1599, C<sub>21</sub>H<sub>28</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 388,1595.

Difenilfoszfinoil-1-benzilamino-3-metil-2,5-dihidro-1*H*-foszfol-1-oxid (56e) [9c]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 32,6 (d, <sup>2</sup>*J* = 5,8), 66,7 (d, <sup>2</sup>*J* = 5,8); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 20,3 (d, <sup>3</sup>*J* = 12,7, C<sub>3</sub>–CH<sub>3</sub>), 34,9 (<sup>1</sup>*J* = 80,4, C<sub>5</sub>), 37,6 (<sup>1</sup>*J* = 84,0, C<sub>2</sub>), 48,5 (NCH<sub>2</sub>), 120,0 (<sup>2</sup>*J* = 10,6, C<sub>4</sub>), 127,0 (C<sub>1''</sub>), 127,1 (C<sub>3''</sub>)\*, 128,1 (C<sub>2''</sub>)\*, 128,5 (d, <sup>3</sup>*J* = 13,2, C<sub>3'</sub>), 130,9 (d, <sup>1</sup>*J* = 124,6, C<sub>1'</sub>), 132,2 (bd, <sup>2</sup>*J* = 10,5, C<sub>2'</sub>), 132,4 (d, <sup>4</sup>*J* = 2,8, C<sub>4'</sub>), 136,0 (<sup>2</sup>*J* = 16,4, C<sub>3</sub>), 137,5 (C<sub>4''</sub>), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,72 (s, 3H, C<sub>3</sub>–CH<sub>3</sub>), 2,15–2,43 (m, 2H, PCH<sub>2</sub>), 2,72–2,91 (m, 2H, PCH<sub>2</sub>), 4,50–4,66 (m, 2H, NCH<sub>2</sub>), 5,47 (d, <sup>3</sup>*J*<sub>P,H</sub> = 36,0, 1H, CH=), 6,98–7,18,

7,38–7,57 és 7,72–7,84 (m, 15H, Ar);  $[M+H]^+$ <sub>mért</sub> = 422,1441, C<sub>24</sub>H<sub>26</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 422,1439.

Difenilfoszfinoil-1-*n*-propilamino-3,4-dimetil-2,5-dihidro-1*H*-foszfol-1-oxid (57h) [10a]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 31,8 (d, <sup>2</sup>*J* = 6,8), 59,2 (d, <sup>2</sup>*J* = 6,8); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 10,9 (CH<sub>2</sub>CH<sub>3</sub>), 16,5 (d, <sup>3</sup>*J* = 15,5, C<sub>3</sub>–CH<sub>3</sub>), 24,2 (CH<sub>2</sub>CH<sub>3</sub>), 40,3 (<sup>1</sup>*J* = 82,8, C<sub>2</sub>), 47,4 (NCH<sub>2</sub>), 127,3 (<sup>2</sup>*J* = 12,2, C<sub>3</sub>), 128,6 (d, <sup>3</sup>*J* = 13,1, C<sub>3</sub>'), 131,5 (d, <sup>1</sup>*J* = 124,4, C<sub>1</sub>'), 132,1 (d, <sup>3</sup>*J* = 10,4, C<sub>2</sub>'), 132,5 (d, <sup>4</sup>*J* = 2,8, C<sub>4</sub>'); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,53 (t, <sup>3</sup>*J*<sub>H,H</sub> = 7,4, 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,16–1,33 (m, 2H, CH<sub>2</sub>), 1,69 (s, 6H, C<sub>3</sub>–CH<sub>3</sub>), 2,25–2,45 (m, 2H, PCH<sub>2</sub>), 2,90–3,04 (m, 2H, PCH<sub>2</sub>), 3,10–3,28 (m, 2H, NCH<sub>2</sub>), 7,43–7,66 és 7,72–7,85 (m, 10H, Ar);  $[M+H]^+$ <sub>mért</sub> = 388,1599, C<sub>21</sub>H<sub>28</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 388,1595.

Difenilfoszfinoil-1-*n*-butilamino-3,4-dimetil-2,5-dihidro-1*H*-foszfol-1-oxid (57a) [10b]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 31,7 (d, <sup>2</sup>*J* = 6,9), 59,1 (d, <sup>2</sup>*J* = 7,0); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,3 (CH<sub>2</sub>CH<sub>3</sub>), 16,5 (d, <sup>3</sup>*J* = 15,5, C<sub>3</sub>–CH<sub>3</sub>), 19,7 (CH<sub>2</sub>CH<sub>3</sub>), 32,9 (NCH<sub>2</sub>CH<sub>2</sub>), 40,3 (<sup>1</sup>*J* = 82,8, C<sub>2</sub>), 45,6 (NCH<sub>2</sub>), 127,2 (<sup>2</sup>*J* = 12,3, C<sub>3</sub>), 128,6 (d, <sup>3</sup>*J* = 13,1, C<sub>3</sub>'), 131,5 (d, <sup>1</sup>*J* = 124,5, C<sub>1</sub>'), 132,1 (d, <sup>3</sup>*J* = 10,4, C<sub>2</sub>'), 132,4 (d, <sup>4</sup>*J* = 2,8, C<sub>4</sub>'); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,58 (t, <sup>3</sup>*J*<sub>H,H</sub> = 7,4, 3H, CH<sub>2</sub>CH<sub>3</sub>), 0,88–0,97 (m, 2H, CH<sub>2</sub>), 1,17–1,26 (m, 2H, CH<sub>2</sub>), 1,69 (s, 6H, C<sub>3</sub>–CH<sub>3</sub>), 2,30–2,41 (m, 2H, PCH<sub>2</sub>), 2,91–3,01 (m, 2H, PCH<sub>2</sub>), 3,16–3,27 (m, 2H, NCH<sub>2</sub>), 7,47–7,53 és 7,56–7,61 (m, 10H, Ar);  $[M+H]^+$ <sub>mért</sub> = 402,1750, C<sub>22</sub>H<sub>29</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 402,1752.

Difenilfoszfinoil-1-benzilamino-3,4-dimetil-2,5-dihidro-1*H*-foszfol-1-oxid (57e) [10c]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 32,4 (d, <sup>2</sup>*J* = 5,5), 60,1 (d, <sup>2</sup>*J* = 5,5); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 16,3 (d, <sup>3</sup>*J* = 15,4, C<sub>3</sub>–CH<sub>3</sub>), 39,6 (<sup>1</sup>*J* = 82,6, C<sub>2</sub>), 48,6 (NCH<sub>2</sub>), 127,0 (C<sub>1</sub>''), 127,1 (C<sub>3</sub>'')\*, 127,2 (<sup>2</sup>*J* = 12,3, C<sub>3</sub>), 128,1 (C<sub>2</sub>'')\*, 128,5 (d, <sup>3</sup>*J* = 13,2, C<sub>3</sub>'), 131,0 (d, <sup>1</sup>*J* = 124,8, C<sub>1</sub>'), 132,3 (d, <sup>2</sup>*J* = 10,6, C<sub>2</sub>'), 132,4 (d, <sup>4</sup>*J* = 4,4, C<sub>4</sub>'), 137,6 (C<sub>4</sub>''), \*felcserélhető; <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,61 (s, 6H, C<sub>3</sub>–CH<sub>3</sub>),

2,15–2,37 (m, 2H, PCH<sub>2</sub>), 2,76–2,93 (m, 2H, PCH<sub>2</sub>), 4,47–4,65 (m, 2H, NCH<sub>2</sub>), 6,98–7,21, 7,33–7,64 és 7,71–7,87 (m, 15H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 436,1598, C<sub>25</sub>H<sub>28</sub>NO<sub>2</sub>P<sub>2</sub>-re számított: 436,1595.

Dietilfoszforil-1-*n*-butilamino-3-metil-2,5-dihidro-1*H*-foszfol-1-oxid (58a) [11b]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 3,8 (d, <sup>2</sup>J = 16,4), 65,5 (d, <sup>2</sup>J = 16,4); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,7 (CH<sub>2</sub>CH<sub>3</sub>), 16,0 (d, <sup>3</sup>J = 7,2, OCH<sub>2</sub>CH<sub>3</sub>), 20,0 (CH<sub>2</sub>CH<sub>3</sub>), 20,5 (d, <sup>3</sup>J = 12,9, C<sub>3</sub>–CH<sub>3</sub>), 33,2 (NCH<sub>2</sub>CH<sub>2</sub>), 34,6 (<sup>1</sup>J = 81,7, C<sub>5</sub>), 37,2 (<sup>1</sup>J = 85,4, C<sub>2</sub>), 45,2 (NCH<sub>2</sub>), 63,0 (d, <sup>2</sup>J = 5,4, OCH<sub>2</sub>), 120,1 (<sup>2</sup>J = 10,5, C<sub>4</sub>), 136,1 (<sup>2</sup>J = 16,6, C<sub>3</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 0,92 (t, <sup>3</sup>J<sub>H,H</sub> = 7,4, 3H, CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>), 1,26–1,36 (m, 8H, CH<sub>2</sub>, CH<sub>3</sub>), 1,62–1,72 (m, 2H, CH<sub>2</sub>), 1,82 (s, 3H, C<sub>3</sub>–CH<sub>3</sub>), 2,32–2,60 (m, 2H, PCH<sub>2</sub>), 2,78–2,92 (m, 2H, PCH<sub>2</sub>), 3,26–3,38 (m, 2H, NCH<sub>2</sub>), 4,03–4,17 (m, 4H, OCH<sub>2</sub>), 5,55 (d, <sup>3</sup>J<sub>P,H</sub> = 36,2, 1H, CH=); [M+H]<sup>+</sup><sub>mért</sub> = 324,1497, C<sub>13</sub>H<sub>28</sub>NO<sub>4</sub>P<sub>2</sub>-re számított: 324,1494.

Dietilfoszforil-1-benzilamino-3-metil-2,5-dihidro-1*H*-foszfol-1-oxid (58e) [11c]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ 3,1 (d, <sup>2</sup>J = 15,9), 66,3 (d, <sup>2</sup>J = 15,9); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 15,8 (d, <sup>3</sup>J = 7,4, OCH<sub>2</sub>CH<sub>3</sub>), 20,5 (d, <sup>3</sup>J = 13,0, C<sub>3</sub>–CH<sub>3</sub>), 34,6 (<sup>1</sup>J = 81,3, C<sub>5</sub>), 37,2 (<sup>1</sup>J = 85,0, C<sub>2</sub>), 47,6 (NCH<sub>2</sub>), 63,1 (d, <sup>2</sup>J = 5,4, OCH<sub>2</sub>), 120,2 (<sup>2</sup>J = 10,7, C<sub>4</sub>), 127,4 (C<sub>1</sub>), 128,3 (C<sub>2</sub>, C<sub>3</sub>), 136,1 (<sup>2</sup>J = 16,7, C<sub>3</sub>), 138,4 (C<sub>4</sub>); <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 1,19 (m, 6H, CH<sub>2</sub>CH<sub>3</sub>), 1,79 (s, 3H, C<sub>3</sub>–CH<sub>3</sub>), 2,36–2,58 (m, 2H, PCH<sub>2</sub>), 2,77–2,92 (m, 2H, PCH<sub>2</sub>), 3,73–3,86 (m, 2H, OCH<sub>2</sub>), 3,96–4,06 (m, 2H, OCH<sub>2</sub>), 4,56–4,63 (m, 2H, NCH<sub>2</sub>), 5,54 (d, <sup>3</sup>J<sub>P,H</sub> = 36,4, 1H, CH=), 7,22–7,46 (m, 5H, Ar); [M+H]<sup>+</sup><sub>mért</sub> = 358,1340, C<sub>16</sub>H<sub>26</sub>NO<sub>4</sub>P<sub>2</sub>-re számított: 358,1337.

Difenilfoszforil-1-*n*-butilamino-3-metil-2,5-dihidro-1*H*-foszfol-1-oxid (59a) [12b]<sup>220</sup>

<sup>31</sup>P NMR (CDCl<sub>3</sub>) δ -5,81 (d, <sup>2</sup>J = 17,9), 66,6 (d, <sup>2</sup>J = 17,9); <sup>13</sup>C NMR (CDCl<sub>3</sub>) δ 13,7 (CH<sub>2</sub>CH<sub>3</sub>), 20,1 (CH<sub>2</sub>CH<sub>3</sub>), 20,5 (d, <sup>3</sup>J = 13,2, C<sub>3</sub>–CH<sub>3</sub>), 33,1 (NCH<sub>2</sub>CH<sub>2</sub>), 34,9 (<sup>1</sup>J = 80,7, C<sub>5</sub>), 37,4 (<sup>1</sup>J = 84,5, C<sub>2</sub>), 45,7 (NCH<sub>2</sub>), 120,1 (<sup>2</sup>J ≈ 10,7, C<sub>4</sub>) részben átlapolva: 120,2 (<sup>3</sup>J =



4,6) és 120,3 ( $^3J = 4,6$ ) C<sub>2</sub>, 125,5 (C<sub>4</sub>), 129,8 (C<sub>3</sub>), 136,1 (d,  $^2J = 16,9$ , C<sub>3</sub>), 150,1 (d,  $^2J = 7,1$ ) és 150,2 (d,  $^2J = 7,2$ ) C<sub>1</sub>;  $^1\text{H}$  NMR (CDCl<sub>3</sub>)  $\delta$  0,95 (t,  $^3J_{\text{H,H}} = 7,3$ , 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,29–1,46 (m, 2H, CH<sub>2</sub>), 1,73–1,87 (m, CH<sub>2</sub>) és 1,77 (s, C<sub>3</sub>–CH<sub>3</sub>) részben átlapolva, teljes intenzitás 5H, 2,26–2,56 (m, 2H, PCH<sub>2</sub>), 2,64–2,86 (m, 2H, PCH<sub>2</sub>), 3,48–3,68 (m, 2H, NCH<sub>2</sub>), 5,52 (d,  $^3J_{\text{P,H}} = 35,5$ , 1H, CH=), 7,15–7,40 (m, 10H, Ar);  $[\text{M}+\text{H}]^+_{\text{mért}} = 420,1497$ , C<sub>21</sub>H<sub>28</sub>NO<sub>4</sub>P<sub>2</sub>-re számított: 420,1494.

Difenilfoszforil-1-*n*-butilamino-3,4-dimetil-2,5-dihidro-1*H*-foszfol-1-oxid (60a) [13b]<sup>220</sup>

$^{31}\text{P}$  NMR (CDCl<sub>3</sub>)  $\delta$  -5,7 (d,  $^2J = 17,1$ ), 60,0 (d,  $^2J = 17,1$ );  $^{13}\text{C}$  NMR (CDCl<sub>3</sub>)  $\delta$  13,7 (CH<sub>2</sub>CH<sub>3</sub>), 16,5 (d,  $^3J = 15,9$ , C<sub>3</sub>–CH<sub>3</sub>), 20,1 (CH<sub>2</sub>CH<sub>3</sub>), 33,2 (NCH<sub>2</sub>CH<sub>2</sub>), 39,5 ( $^1J = 83,1$ , C<sub>2</sub>), 45,8 (NCH<sub>2</sub>), 120,3 (d,  $^3J = 4,8$ , C<sub>2</sub>), 125,5 (C<sub>4</sub>), 127,3 ( $^2J = 12,7$ , C<sub>4</sub>), 129,8 (C<sub>3</sub>), 150,2 (d,  $^2J = 7,0$ , C<sub>1</sub>);  $^1\text{H}$  NMR (CDCl<sub>3</sub>)  $\delta$  0,94 (t,  $^3J_{\text{H,H}} = 7,4$ , 3H, CH<sub>2</sub>CH<sub>3</sub>), 1,30–1,44 (m, 2H, CH<sub>2</sub>), 1,69 (s, 6H, C<sub>3</sub>–CH<sub>3</sub>), 1,72–1,87 (m, 2H, CH<sub>2</sub>), 2,33–2,50 (m, 2H, PCH<sub>2</sub>), 2,71–2,90 (m, 2H, PCH<sub>2</sub>), 3,48–3,66 (m, 2H, NCH<sub>2</sub>), 7,11–7,41 (m, 10H, Ar);  $[\text{M}+\text{H}]^+_{\text{mért}} = 434,1653$ , C<sub>22</sub>H<sub>30</sub>NO<sub>4</sub>P<sub>2</sub>-re számított: 434,1650.

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