

Natural antioxidants: a new way to stabilize polyethylene

PhD Thesis

Balázs Kirschweng

Most important publications:

1. Kirschweng B, Tátraaljai D, Földes E, Pukánszky B.: *Efficiency of curcumin, a natural antioxidant, in the processing stabilization of PE: Concentration effects*, Polymer Degradation and Stability, **118**:17-23, 2015, IF: 3,120.
2. Kirschweng B, Bencze K, Sárközi M, Hégyely B, Samu Gy, Hári J, Tátraaljai D, Földes E, Kállay M, Pukánszky B.: *Melt stabilization of polyethylene with dihydromyricetin, a natural antioxidant*, Polymer Degradation and Stability, **133**:192-200, 2016, IF: 3,120.
3. Kirschweng B, Vörös B, Tátraaljai D, Földes E, Pukánszky B.: *Natural antioxidants as melt stabilizers for PE: comparison of silymarin and quercetin*, European Polymer Journal, **90**:456-466, 2017, IF: 3,477.
4. Kirschweng B, Tátraaljai D, Földes E, Pukánszky B.: *Natural antioxidants as stabilizers for polymers*, Polymer Degradation and Stability, **145**(11):25-40, 2017, IF: 3,386.
5. Kirschweng B, Tilinger MD, Hégyely B, Samu Gy, Tátraaljai D, Földes E, Pukánszky B.: *Melt stabilization of PE with natural antioxidants: Comparison of rutin and quercetin*, European Polymer Journal, **103**:228-237, 2018, IF: 3,531.

Summary:

Polyethylene (PE) is one of the polymers that produced in the largest amounts nowadays. It is frequently applied by the packaging and construction industry because of its exceptional properties. Stabilizer packages have to be used in order to prevent the degradation of the material during its processing, which usually contain a primary, phenolic antioxidant and a peroxide decomposer secondary stabilizer. Because of the unknown effect of reaction products of synthetic phenolic antioxidants on the human health, the scientific interest turned to the possible application of natural antioxidants as primary stabilizers. The aim of our research was to characterize the stabilizing efficiency of such substances under the processing conditions of PE, and to understand the relationship between their chemical structure and efficiency. Experiments were carried out with the application of curcumin, and flavonoid type substances: quercetin, silymarin, rutin and dihydromyricetin. We described the effects of differences in the chemical structure and interactions between the primary and secondary stabilizers on the stabilizing efficiency of these natural antioxidants and drawn conclusions about their applicability, but also marked areas, which need further investigation in the future.