

*Thesis of
Tibor Berecz's
PhD dissertation*

Certain Crystallographic Respects of σ -phase Evolving Heat Treatment and Effects of the Phase's Appearance in SAF-2507 type Duplex Stainless Steel

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- 1) In SAF-2507 type duplex stainless steels mathematical models were written by crystal-geometric methods into the orientation relationships between the body centred cubic ferrite, face centred cubic secondary austenite and tetragonal σ -phase the latter phases arisen by the isothermally decomposition of ferrite what mathematical models consider the crystal-symmetries and the changing of lattice-parameters, and the correctness of these mathematical models were verified by results of measurements:
 - a) Mathematical model was written into the orientation relationship $(\bar{1}10)_\sigma // (\bar{1}\bar{1}0)_\delta$ and $[332]_\sigma // [\bar{1}\bar{1}\bar{3}]_\delta$ between the ferrite and σ -phase determined previously by other method and the correctness of this model were verified by results of measurements.
 - b) Mathematical model was written into the orientation relationship $(100)_\sigma // (100)_\gamma$ and $[032]_\sigma // [011]_\gamma$ between the secondary austenite and σ -phase determined previously by other method and the correctness of this model were verified by results of measurements.
 - c) Mathematical model was written into the orientation relationship $(111)_\gamma // (001)_\sigma$ and $[\bar{1}01]_\gamma // [110]_\sigma$ between the secondary austenite and σ -phase determined previously by other method and the correctness of this model were verified by results of measurements.
- 2) It was found by my calculations and measurements that in SAF-2507 type duplex stainless steels the orientation relationship between the secondary austenite and σ -phase is written with more accuracy (it means fewer average deflection between the measured and calculated results and means fewer spread) by $(111)_\gamma // (001)_\sigma$ and $[\bar{1}01]_\gamma // [110]_\sigma$ than $(100)_\sigma // (100)_\gamma$ and $[032]_\sigma // [011]_\gamma$.
- 3) On different durations isothermally heat treated specimen made from SAF-2507 type duplex stainless steel it was found that the orientation-differences between the ferrite, secondary austenite and σ -phases the latter phases arisen by the isothermally decomposition are independence from the duration of heat treatment; furthermore it was found that angle-deviations between the calculated and measured orientations are much fewer when a parent-inherited relation may be hypothesized between the studied grains, subgrains. A parent-inherited relation may be hypothesized between two given grains with greater chance when a σ -phase grain can be found between a ferritic and austenitic grain.