Relating Elastic-Plastic Strain Gradient in Austenite with Martensite Variant selection

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Abstract

This study involved thermo-mechanical processing of austenite grains, so that different elastic-plastic strain gradients emerged. These were estimated by pixel-by-pixel reconstruction plus kinematical and dynamical pattern simulations. In particular, gradients in local misorientation and residual stresses in reconstructed prior austenite grains were shown to affect hierarchical martensite microstructure and anisotropy in martensite crystallographic texture. These originated by altering the austenite-to-martensite transformation strain(s), as reflected on the changes in traditional interaction energies and more quantitavely on the direct effects of residual strain on the actual transformation induced shear. In brief, this study brought out a unique perspective of austenite elastic-plastic strain gradients on the martensite variant selection.

Keywords: Martensite, Reconstruction, Variant selection, Strain Gradient, Microstructure, Texture.

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