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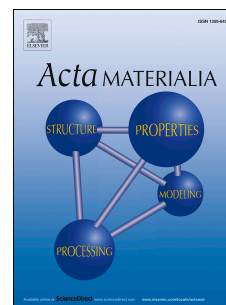
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# Tensorial Nature of $\gamma'$ -rafting evolution in nickel-based single crystal superalloys

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## Abstract

Our work aims at providing a tensorial analysis of directional  $\gamma'$  rafting state in a nickel based single crystal superalloy, for several orientations. According to a visco-plasticity modeling accounting for microstructure evolution during creep (including rafting), different —even— order fabric tensor representations are provided, respectively for  $\gamma$  channel width, primary  $\gamma'$  cuboidal particles and microstructure periodicity  $\lambda$ . Several image processing algorithms are presented and used to best measure these quantities, particularly the AutoCorrelation Method (ACM) and the Rotational Intercept Method (RIM). Each method is developed for a specific purpose: the AutoCorrelation Method yields information about principal directions and pattern periodicity, while RIM method provides a polar distribution of a physical quantity. A methodology is proposed and applied to measure the Rose diagrams and the corresponding fabric tensors of order 2, 4, 6 and 8, starting by the best fitting Fourier series coefficients of the experimental data. When RIM method is possible to apply, fabric tensors up to order 8 are considered. In any case a 2<sup>nd</sup> order tensor representation of single crystals  $\gamma'$  rafting state is provided.

*Keywords:* autocorrelation; cubic microstructure; image analysis; fabric tensor; Orowan stress; rafting;

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