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# Texture simulation of a severely cold rolled low carbon steel using polycrystal modeling

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## Abstract

Characteristic textures of cold-rolled low carbon steel consist of the RD// $\langle 110 \rangle$  fiber ( $\alpha$  fiber) and ND// $\{111\}$  fiber ( $\gamma$  fiber). Although the development of the  $\gamma$  fiber has been successfully modeled by the relaxed constraints polycrystal plasticity model, the modeling of the  $\alpha$  fiber has been less successful. In this work, we investigate the mechanism underlying the development of a strong  $\alpha$  fiber of a low carbon steel during cold rolling to thickness reductions of 90%, 98%, and 99.8%. We compare the deformation textures measured using X-ray and electron backscatter diffraction methods and those simulated using polycrystal models, employing one of four homogenization schemes: Taylor model, Secant model, Tangent model and an intermediate stiffness model between Secant and Tangent models. The measured textures consisted of an extremely strong  $\alpha$  fiber and unusually weak  $\gamma$  fiber. The calculated textures achieved the best agreement with the measured one when (1) the

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