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S. Takajo, C.N. Tomé, S.C. Vogel, I.J. Beyerlein

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

S. Takajo[a,b,*], C.N. Tomé[b], S.C. Vogel[b], I.J. Beyerlein[c]

[a] *Electrical Steel Research Dept., JFE Steel Corp., Kurashiki 712, Japan*
[b] *Materials Science and Technology Division, Los Alamos National Laboratory, Los Alamos, NM 87545, USA*
[c] *Mechanical Engineering and Materials Departments, University of California, Santa Barbara, CA 93106, USA*

Abstract

Characteristic textures of cold-rolled low carbon steel consist of the RD//$\langle 110 \rangle$ fiber (α fiber) and ND//$\{111\}$ fiber (γ fiber). Although the development of the γ fiber has been successfully modeled by the relaxed constraints polycrystal plasticity model, the modeling of the α fiber has been less successful. In this work, we investigate the mechanism underlying the development of a strong α 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 α fiber and unusually weak γ fiber. The calculated textures achieved the best agreement with the measured one when (1) the

*Corresponding author
Email address: stakajo@lanl.gov (S. Takajo)