IMPLEMENTATION OF EXACT GRAIN-BOUNDARY GEOMETRY INTO A 3D MONTE-CARLO (POTTS) MODEL FOR MICROSTRUCTURE EVOLUTION

O.M. Ivasishin, S.V. Shevchenko, S.L. Semiatin[1], *O.P. Shljachta*

Institute for Metal Physics
(*36, Vernadsky Str., Kyiv 03142, Ukraine*),
[1]Air Force Research Laboratory, AFRL/RXLM,
Wright-Patterson Air Force Base
(*OH 45433-7817, USA*)

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A three-dimensional Monte-Carlo (Potts) model is modified to incorporate the effect of grain-boundary inclination on the boundary mobility. For this purpose, a straightforward geometric construction is developed to determine the local orientation of a grain-boundary plane in the discrete model volume. The combined effects of the grain-boundary misorientation of crystal lattices and the misorientation of the normal to a grain-boundary plane on the effective grain-boundary mobility were incorporated into the Monte-Carlo code using the definition of tilt-twist component (TTC). The modified code was validated by simulating the grain growth in microstructures comprising equiaxed or elongated grains, as well as the static recrystallization of a microstructure of deformed (elongated) grains.