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Theoretical and Computational Studies of Three-dimensional Phase Separation K.G. WANG, M.E. GLICKSMAN, K. RAJAN, Materials Science and Engineering Department, Rensselaer Polytechnic Institute, Troy, NY 12180
— The diffusive interactions occurring within a population of precipitates dispersed throughout a contiguous matrix may be described on the basis of a diffusion screening length. Screening theory predicts as functions of the dispersoid volume fraction the changes in diffusion screening length, maximum particle size, coarsening rate, and the scaled particle-size distribution. Furthermore, by considering fluctuations observed in the growth rates of individual particles, we report on developments of a stochastic theory of phase separation. Also, particle-size distributions and the maximum particle radii predicted as a function of time from theory and simulations are shown to agree well with experimental results obtained from measurements performed on Al_3Li precipitates in binary Al-Li alloys. Lastly, we calculated the spatial correlation function of these microstructures. We revealed through data analysis the relationship between the critical length scale for diffusion-mediated coarsening and spatial correlations in the microstructure.

K.G. Wang

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