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Late time growth dynamics in the Cahn-Hilliard equation[1]
TMOTHY S. SULLIVAN, Department of Physics, Kenyon College, P. PALFFY-MUHORAY, Liquid Crystal Institute, Kent State University — Numerical simulations were carried out in 2D of the scaled Cahn-Hilliard equation $[\partial\psi/\partial t = (1/2)\nabla^2(-\psi + \psi^3 - \nabla^2\psi)]$ starting from Gaussian distributed, random initial conditions on a 540x540 square grid. Simulations were run for a dimensionless time of 200,000, a factor of ten beyond previously reported results. The simulations also covered a broad range of values of the mean composition, including several at values that had not previously been reported. For each composition and for time intervals of no longer than 5000 in dimensionless time, the structure factor was calculated for sixty separate runs and averaged. The pair correlation function was then calculated from the average structure factor and its first zero crossing,$R_G(t)$, taken as a measure of the average domain size, was determined. An equation of the form $R_G(t) = at^b + c$ was then fit to our data over the dimensionless time range from 5000 to 200,000. In contrast to previous work, we find that the scaling exponent b varies with mean coomposition and does not appear to be consistent with the Lifshitz-Slyozov result $b = 1/3$. The largest deviation occurs at a mean composition of 0.2, where $b = 0.244 \pm 0.003$. We discuss the possible effects of morphology on both the scaling law and the time it takes to reach the scaling regime.

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