Ginzburg-Landau Study of Superconductor with Regular Pinning Array

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Abstract

The vortex distributions and dynamics in superconductors with triangular and honeycomb pinning arrays are investigated by numerical simulation of the two- dimensional (2-D) time-dependent Ginzburg－Landau equations. Periodic boundary conditions are implemented through specific gauge transformations under lattice translations. We model the pinning sites as holes. The simulation results at different magnetic fields are presented. For film with regular triangular pinning array, the vortices are all captured within the holes for a wide range of magnetic fields. For film with regular honeycomb pinning array, the interstitial vortices appear at relatively low magnetic fields. With an increase of magnetic field, the new vortices may enter the holes again and keep the number of vortices at the interstitial positions unchanged. These results confirm our explanations of the experimental results we obtained earlier.

Keyword：Pinning arrays · Superconductor ·