Experimental and simulation study of missing matching peaks in Nb thin films with square pinning arrays

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Abstract

Square arrays of circular pinning centers of various diameters were patterned in Nb thin films to explore their vortex pinning behavior. Periodic critical current matching peaks and some "missing peaks" were observed in magnetotransport measurements. The larger the diameter of the pinning centers, the higher the index of the missing matching fields observed. This phenomenon is explained by molecular dynamics simulations and is caused by the interaction between interstitial vortices and vortices occupying the pinning centers.

Keyword：matching peak, Nb thin film, square pinning arrays, molecular dynamics simulations