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Towards critical current by design IVAN SADOVSKYY, ALEXEI KOSHELEV, ANDREAS GLATZ, Argonne National Laboratory — Understanding dynamic behavior of vortex matter in complicated pinning landscapes is a major challenge for both fundamental science and energy applications. In particular, critical current can be significantly enhances by optimizing type, size and density of inclusions. We present the large-scale simulations for vortex dynamics. We analyzed a number of inclusion types and found optimal configurations corresponding to the maximal critical current. Particularly, we studied the interplay between vortex-vortex and vortex-inclusion interactions in the presence of columnar defects (e.g., irradiated by heavy ions at an angle), chemically grown nanorods, spherical inclusions (e.g., irradiated by protons or self-assembled). We compared our simulations to several experimental results and found a good agreement.

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