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**Vortex dynamics and critical current in superconductors with unidirectional twin boundaries** HIDEHIRO ASAI, SATOSHI WATANABE, Department of Materials Engineering, The University of Tokyo — The pinning of superconducting vortices is important in device applications of superconductors, because immobilization of vortices at pinning sites is essential for lossless transport. Twin boundary (TB) is one of possible candidates for effective pinning centers, in particular in  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ . Thus, their pinning properties have been actively studied both experimentally and theoretically. However, the pinning characteristics of high-density TBs, which have recently been fabricated successfully, are still unclear. We have studied the dynamics of vortices interacting with unidirectional twin boundaries in a superconductor using molecular dynamics simulation. Current-voltage curves and critical currents have been calculated as a function of vortex density. We found that the critical current as a function of vortex density reveals a staircase pattern and this pattern depends on the pinning strength. This behavior corresponds to discontinuous change of vortex configurations, which reflects vortex pinning characteristics of superconductors with TBs. We also discuss the matching effect of vortex lattice with TBs, and reveal its behavior is different from the one in superconductors with columnar pinning.

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