

## PCP1-2

### Vortex lattice melting transition : Effects of artificial nanorods

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It is known that vortices in a mesoscopic superconductor show peculiar structures, which depend on the shape of the superconductor. Ooi et al [1] found that melting transition temperatures of vortex lattices in a square superconducting plate become maximum when the vortex number is a square number. Then using the molecular dynamics method (MD), Kato and Kitago [2] investigated the vortex lattice melting transition in a pure superconductor. They showed standard deviation of vortex position increases rapidly with increasing temperature.

We investigated this melting of vortex lattice in a dirty square mesoscopic superconductor, using MD. We found when the vortex number is a multiple of 4, the vortex lattice becomes rather stable. [Fig.1: The standard deviations of 4 to 101 vortices in the square superconducting plate including 100 impurities as a function of the number of vortices.] So we consider other shape superconductors because of stable vortex state in the superconducting plate.

It is known that the superconducting properties are improved by adding nanorods to superconductor [3]. We investigate the melting transition of the vortex lattice in a square superconductor with nanorods, or nanorods array.

[1] S. Ooi, T. Mochiku, M. Tachiki, and K. Hirata PRL 114, 097001 (2015)

[2] M. Kato, H. Kitago, J. Phys. Conf. Ser. 871, 012028 (2017)

[3] J. L. MacManus-Driscoll et al., Nat. Mater. 3, 439 (2004)

