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Stability of low-friction surface sliding of nanocrystals with rectangular symmetry and application to W on $\text{NaF}(001)$

Astrid S. de Wijn, Annalisa Fasolino

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We investigate the stability of low-friction sliding of nanocrystal with rectangular atomic arrangement on rectangular lattices, for which analytical results can be obtained. We find that several incommensurate periodic orbits exist and are stable against thermal fluctuations and other perturbations. As incommensurate orientations lead to low corrugation, and therefore low friction, such incommensurate periodic orbits are interesting for the study of nanotribology. The analytical results compare very well with simulations of W nanocrystals on $\text{NaF}(001)$. The geometry and high typical corrugation of substrates with square lattices increase the robustness compared to typical hexagonal lattices, such as graphite.

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