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Interstitials in 2D colloidal crystals LICHAO YU, SUNGCHEOL KIM, Brown University, ALEXANDROS PERTSINIDIS, Sloan-Kettering Institute, XINSHENG LING, Brown University — Point defects in crystalline solids are important in many areas of condensed matter physics, ranging from the mechanical properties of metals, to supersolidity in quantum solids, and most recently the magnetic properties of graphene. A key question to point defects is how they diffuse in the crystalline lattice. Colloidal crystals provide a perfect model system for studying the dynamics of point defects, since the kinetic pathways of diffusion can be identified in direct real-time video imaging experiments. Here we report an experimental study of another type of point defects: interstitials. We found that interstitial diffusion in a 2D colloidal crystal is also dominated by a dislocation pair unbinding-binding process. Similar to vacancies, interstitial diffusion exhibits strong memory effects. However, the contrast lies in the observation that the interstitials, as quasi-particles, diffuse faster than vacancies. We propose that higher diffusion constant of the interstitials is a result of the suppression of the Peierls barrier for the edge dislocations by the excess strain created by the extra particle(s). This work was supported by NSF-DMR.

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