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Simulating the Melting Transition of Helium in Two Dimensions
KEOLA WIERSCHEM, MARTECH & Dept. of Physics, Florida State University, EFSTRATIOS MANOUSAKIS, MARTECH & Dept. of Physics, Florida State University, and Dept. of Physics, University of Athens, Greece — We study the melting behavior of ^{4}He in two dimensions with the path integral Monte Carlo method. Systems of helium atoms are simulated in a periodic cell designed to accommodate a triangular solid. We calculate the translational and orientational order parameters, as well as the defect fraction. Defects are defined as atoms with more or less than six neighbors; the nearest neighbor network is found through Delaunay triangulation. Two dimensional melting is a defect-mediated phase transition, thus, defects will proliferate as the solid is melted. Additionally, melting is expected to occur via a two-stage process, with transitions for both translational and orientational order. At high number density (0.0846 Å^{-2}), we have seen a single transition (within the accuracy of our simulations). We are currently working to observe the melting transition at lower densities.

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