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# Chiral spin texture in the charge-density-wave phase of the correlated metallic Pb/Si(111) monolayer

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Abstract:

We investigate the 1/3 monolayer α-Pb/Si(111) surface by scanning tunneling spectroscopy (STS) and fully relativistic first-principles calculations. We study both the high-temperature $3^{-}\sqrt{}\times 3^{-}\sqrt{}$ and low-temperature 3×3 reconstructions and show that, in both phases, the spin-orbit interaction leads to an energy splitting as large as 25% of the valence-band bandwidth. Relativistic effects, electronic correlations and Pb-substrate interaction cooperate to stabilize a correlated low-temperature paramagnetic phase with well-developed lower and upper Hubbard bands coexisting with 3×3 periodicity. By comparing the Fourier transform of STS conductance maps at the Fermi level with calculated quasiparticle interference from non-magnetic impurities, we demonstrate the occurrence of two large hexagonal Fermi sheets with in-plane spin polarizations and opposite helicities.