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Effects of one-dimensional multiband electronic structure on indirect interaction between Pb atoms adsorbed on the In(4x1)-Si(111) surface M. HUPALO, T.-L. CHAN, C. Z. WANG, K. M. HO, M. TRINGIDES, Iowa State University, Ames Laboratory of US DOE, Ames, IA 50011 — As predicted theoretically indirect interactions between adatoms on a metal surface can be mediated by the exchange of electrons trough the conduction band of the substrate. The long-range oscillating character of these interactions is attributed to the Friedel oscillations of the conducting electron density which screen adatoms and lattice distortions caused by adatoms. The period of the oscillations is determined by the Fermi wave-length. We have studied the growth of Pb submonolayer films on the quasi-one-dimensional In(4x1)-Si(111) which as known from spectroscopic experiments has a triple-band metallic electronic structure. A novel ordered phase of Pb is discovered with a non-primitive unit cell. Islands of this phase form well below its stoichiometric concentration (θ=6/32ML). The period of the structure is 8 times the substrate lattice constant a and its unit cell includes three nonequivalent Pb dimers. The average distance between the dimers is $2.66a$.The origin of this structure is the long-range indirect interaction between Pb atoms and the observed periodicity is explained by the contribution of the three surface electronic bands with different Fermi wave-lengths.

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