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Anisotropic Surface State Mediated RKKY Interaction Between Adatoms on a Hexagonal Lattice[1] THEODORE EINSTEIN, University of Maryland, College Park, PAUL PATRONE, University of Maryland, College Park; and NIST Gaithersburg — Motivated by recent numerical studies of Ag on Pt(111), we derive a far-field expression for the RKKY interaction mediated by surface states on a (111) FCC surface, considering the effect of anisotropy in the Fermi edge. The main contribution to the interaction comes from electrons whose Fermi velocity $\mathbf{v}_F$ is parallel to the vector $\mathbf{R}$ connecting the interacting adatoms; we show that in general, the corresponding Fermi wave-vector $\mathbf{k}_F$ is not parallel to $\mathbf{R}$. The interaction is oscillatory; the amplitude and wavelength of oscillations have angular dependence arising from the anisotropy of the surface state band structure. The wavelength, in particular, is determined by the component of the aforementioned $\mathbf{k}_F$ that is parallel to $\mathbf{R}$. Our analysis is easily generalized to other systems. For Ag on Pt(111), our results indicate that the RKKY interaction between pairs of adatoms should be nearly isotropic and so cannot account for the anisotropy found in the studies motivating our work.

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