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Effect of spin-orbit interaction on a magnetic impurity in the vicinity of a surface LASZLO SZUNYOGH[1], GERGELY ZARAND, Department of Theoretical Physics, Budapest University of Technology and Economics, Budapest, Hungary, M. CARMEN MUNOZ, Instituto de Ciencia de Materiales de Madrid, CSIC, Madrid, Spain, BALAZS L. GYORFFY, H.H. Wills Physics Laboratory, University of Bristol, Bristol, U.K. — The most successful explanation to the Kondo effect in thin films relies on the assumption that the dynamics of magnetic impurities is frozen due to surface-induced anisotropy effects. Combining a simple tight-binding calculation for the semi-infinite geometry of the host metal with a description of the coupling of the spin of magnetic atom with its neighborhood by means of Abrikosov's pseudofermion technique, we study the spin-orbit induced anisotropy in two models: *(i)* a $J = 3/2$ impurity with strong local spin-orbit coupling and *(ii)* a $S = 3/2$ impurity embedded into a host with spin-orbit coupling. We find that in both cases the anisotropy energy is an oscillating function of the distance d from the surface with an amplitude that decays as $1/d^2$. This observation is clearly supported by an asymptotic analysis of the spectral function of the host. Furthermore, numerical estimates suggest that the first kind of mechanism gives rise to an anisotropy energy of the desired order of magnitude. A simple physical interpretation of the effect emerges naturally.

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