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Giant Rashba effect and Dirac points in deep d-orbital noble metal surface states RYAN REQUIST, International School for Advanced Studies (SISSA), Trieste, Italy, POLINA SHEVERDYAEVA, PAOLO MORAS, CARLO CARBONE, Institute for Material Structure (ISM CNR), Trieste, Italy, ERIO TOSATTI, International School for Advanced Studies (SISSA) and International Center for Theoretical Physics, Trieste, Italy — The chiral spin polarization, band splitting, and topological states generated by Rashba spin-orbit interaction at crystal surfaces and interfaces have received a lot of attention recently. Most studies have focused on *sp* states near the Fermi energy, which are relevant for transport and have long lifetimes. Far less explored, although in principle stronger, are Rashba effects within d states, including those deep below the Fermi energy. Here we report a joint ARPES/first principles study of "giant" Rashba effects in the deep *d* surface states of a 20-layer Ag film grown on Au(111) and a 20-layer Au film grown on Ag(111). Several surface states predicted in [1], some split by $\sim$1 eV, are clearly observed in good overall agreement with first principles calculations. We also find Dirac points at the time-reversal symmetric M point within a large spin-orbit-induced bulk gap, which are visible in both Ag and Au and display all the characteristics of topological surface states, such as chiral spin polarization and robustness to perturbation. Unlike the usually symmetric dispersion at Γ point Dirac cones, these M point cones are strongly anisotropic away from the degeneracy point. [1] R. Mazzarello, A. Dal Corso, E. Tosatti, Surf. Sci. 602, 893 (2008).

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