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Cobalt on silicene/ZrB_2: an intriguing Kondo system TOBIAS GILL, BEN WARNER, HENNING PRSER, UCL, UK, ANTOINE FLEURENCE, YUKIKO YAMADA-TAKAMURA, JAIST, Japan, CYRUS HIRJIBEHEDIN, UCL, UK — Magnetic atoms placed upon metallic substrates have been used as prototypical systems for the investigation of the fundamentals of atomic-scale magnetism. Often these magnetic impurities undergo the Kondo effect, in which the magnetic moment of the impurity is collectively screened by a cloud of conduction electrons forming a many-body singlet ground state. Here we present results for individual Co adatoms on the silicene/ZrB_2 surface. Unlike on metallic surfaces, Co atoms exhibit a distinct energy-dependent change in the spatial distribution of their electronic states when imaged with scanning tunneling microscopy. At low biases around the Fermi level, the Co atoms exhibit a two-lobe structure that is oriented along one of three equivalent directions in the plane and that is revealed by scanning tunneling spectroscopy to result from a Kondo resonance centered upon each lobe. This spatially anisotropic Kondo resonance is reminiscent of the orbital states of magnetic atoms on semiconductor surfaces or of the spatially distributed Kondo resonances seen for magnetic molecules on metallic surfaces, and is a result of the interaction between a magnetic impurity and the unusual electronic structure of the silicene/ZrB_2 surface.

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