Abstract Submitted for the MAR10 Meeting of The American Physical Society

Orbitally controlled Kondo effect of Co ad-atoms on graphene TIM WEHLING, University of Hamburg, Germany, ALEXANDER BALATSKY, Los Alamos National Laboratory, MIKHAIL KATSNELSON, Radboud University Nijmegen, The Netherlands, ALEXANDER LICHTENSTEIN, University of Hamburg, Germany, ACHIM ROSCH, University of Cologne, Germany — Based on ab-initio calculations we identify possible scenarios for the Kondo effect due to Co ad-atoms on graphene. For a Co atom absorbed on top of a carbon atom, the Kondo effect is quenched by spin-orbit coupling below an energy scale of ~15 K. For Co with spin S = 1/2 located in the center of a hexagon, an SU(4) Kondo model describes the entanglement of orbital moment and spin at higher energies, while below ~ 60 meV spin-orbit coupling leads to a more conventional SU(2) Kondo effect. The interplay of the orbital Co physics and the peculiar band-structure of graphene is directly accessible in Fourier transform tunneling spectroscopy or in the gate-voltage dependence of the Kondo temperature displaying a very strong, characteristic particle-hole asymmetry.

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Date submitted: 20 Nov 2009

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