## Abstract Submitted for the MAR14 Meeting of The American Physical Society

Triangular Lattices of Transition Metals Adsorbed on Graphene MATHEUS P. LIMA, CARLOS M. ACOSTA, University of Sao Paulo, ROBERTO H. MIWA, University of Uberlandia, ANTONIO J.R. DA SILVA, ADALBERTO FAZZIO, University of Sao Paulo — It is possible to control the electronic properties of graphene (GR) via adsorption. For instance, the increasing of the Spin-Orbit Coupling (SOC) in GR by adsorption of heavy atoms. When these atoms are adsorbed in GR, the SOC leads to a non-trivial opening of a band gap higher than the predicted in pristine GR. Indeed, there are several works addressed to investigate the adsorption of adatoms in GR, where the geometric arrangement of the atoms plays a quite important role. In this work, using ab initio DFT calculations, we present a detailed picture of how the electronic properties of GR are connected to the atomic lattice geometry of TMs (3d, 4d, and 5d) adatoms. Particularly, we show that triangular arrangements of "Ru" and "Os" atoms on GR give rise to: i) two Dirac cones at K-point due to the crystal field, ii) broken of the spin degeneracy due to the exchange field, leading to four Dirac cones, and iii) a non-trivial band gap opens due to the SOC, resulting the Quantum Anomalous Hall phase. The Dirac cones are ruled by a suitable coupling between the TM triangular lattice, and the GR hexagonal lattice. The electronic states near the Dirac points appear in the Local Density of States as peaks or valleys at geometric center of the TM triangles (barycenters).

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Date submitted: 10 Nov 2013 Electronic form version 1.4