Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Antiferromagnetic coupling in cobalt atomic clusters on (110) surface of tungsten RENAT F. SABIRIANOV, University of Nebraska at Omaha, PAVEL LUKASHEV, AXEL ENDERS, University of Nebraska - Lincoln — We report results of the first principles calculations on the structural and magnetic properties of cobalt atomic clusters on (110) surface of tungsten. We found that for certain geometry these clusters can exhibit antiferromagnetic order. The result is unexpected, as in the bulk as well as in the thin films and free standing clusters Co always exhibits ferromagnetic structure. We compare results for Co with the ones for the analogues Fe atomic clusters. We found that Fe clusters deposited on (110) surface of tungsten tend to couple ferromagnetically similar to bcc Fe in considered geometries. In our calculations we analyzed different configurations of atomic islands, in particular N=3, 4, 5, 6, 8, 12, where N is the number of atoms in the cluster. We perform full structural and magnetic relaxation, and we show that depending on the geometry and number of cobalt atoms in the cluster, the system can be non-magnetic (N=4, 6, 8), ferromagnetic (N=3, 5) and antiferromagnetic or ferrimagnetic (N=4, 12). We present phenomenological model to explain this intriguing magnetic properties of Co atomic islands on (110) surface of tungsten.

Pavel Lukashev
University of Nebraska - Lincoln

Date submitted: 19 Nov 2010 Electronic form version 1.4