Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

A high-spin atomic 1-D system with a spin-induced CDW instability[1] NADER ZAKI, CHRIS MARIANETTI, Columbia University, PETER JOHNSON, Brookhaven National Lab, RICHARD OSGOOD, Columbia University — We report on low-temperature STM measurements of a Co atomic-wire system that has been realized by the technique of self-assembly on a vicinal Cu(111) substrate [1,2]. We show that for this bimetallic case, the Co-wire system undergoes a CDW instability leading to a 1-D high-spin system. This type of instability does not appear to have been previously reported for a bi-metallic system, particularly for a chain of Co atoms. Using ab initio theoretical calculations, it is deduced that the CDW instability is spin-induced by way of symmetry breaking in the spin population. This result presents a fundamental electronic-structure mechanism for CDW instability that is distinct from previously reported metal-semiconducting systems [3], in that spin clearly plays an essential role in lowering the energy of the system. Furthermore, the calculations indicate that the high-spin correlated state of the constituent Co atoms is a necessary consequence of this CDW instability. Finally, the ferromagnetic nature of this realized system raises questions with regard to substrate spin mediation, such as the possible role of Kondo and RKKY interaction. [1] N. Zaki et al, Phys. Rev. B 80, 155419 (2009) [2] N. Zaki et al, Phys. Rev. B 83, 205420 (2011) [3] P. C. Snijders and H. H. Weitering, Rev. Mod. Phys. 82, 307 (2010)

[1]Department of Energy Contract No. DE-FG 02-04-ER-46157

Nader Zaki
Columbia University

Date submitted: 11 Nov 2011 Electronic form version 1.4