Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Tailoring The Magnetic Properties of TiO_2 Nanobelts SHEN V. CHONG, KAZUHIRO YAMAKI, KAZUO KADOWAKI, Institute of Materials Science, University of Tsukuba — Over the past decades, titanium dioxide has been discovered to exist in various novel nano-structural forms with high aspect-ratio and good crystallinity. Moreover, the addition of dopants and the self-assembling of foreign molecules on the surface can enrich the physical and chemical properties of this semiconductor, enhancing its versatility and further promoting this metal oxide to be an important nano-based functional material. Herein we report on the doping of TiO_2 nanobelts with small amount of cobalt, producing a diluted magnetic semiconductor which display a Curie temperature well above room temperature. Co-doped TiO_2 nanobelts were prepared hydrothermally by powdering a piece of $Co_xTi_{1-x}O_2$ single crystal. The magnetic properties of these nanobelts could be tailored via different heat treatment procedure. Annealing the as-synthesized cobalt titanate in air at 1000 K produced nanobelts which are paramagnetic, while evidence of room temperature ferromagnetism could be observed after the same sample was annealed under vacuum at length. An even more pronounce ferromagnetic behavior was observed when the nanobelts were vacuum annealed direct from the titanate phase. These results again show the importance of oxygen vacancies in unison with the presence of cobalt in inducing room temperature ferromagnetism in this semiconductor.

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Date submitted: 28 Nov 2007 Electronic form version 1.4