COILED MULTIWALLED CARBON NANOTUBES AS ELECTROMECHANICAL RESONATORS

M. Ahlskog[1], A. Volodin[2] and C. Van Haesendonck[2]
1) University of Jyväskylä, Nanoscience Center, P.O.B 35 (YFL), FIN-40014, Finland.
2) Laboratorium voor Vaste-Stoffysica en Magnetisme, Katholieke Universiteit Leuven, B-3001 Leuven, Belgium.
E-mail: ahlskog@phys.jyu.fi

Freestanding carbon nanotubes are being intensively studied as electromechanical resonators. Usually they are constructed from straight, freely suspended nanotubes and the mode of vibration being either lateral or torsional motion of the tube. We have constructed a nanotube resonator according to a very different design, based on coiled multiwalled carbon nanotubes. The nanotube material that we use is synthesized by a CVD technique [1]. The degree of disorder may be substantial, resulting generally in rather curved shape of the tubes. Regularly coiled nanotubes emerge under certain conditions from the CVD reactor. After deposition on a substrate, these nanotube coils have nearly freestanding windings (Figure 1). When exciting the nanotube windings either electrically, via an AFM tip, or acoustically, the fundamental resonances (ranging from 100 to 400 MHz) can be detected. The resonators are sensitive to mass changes as small as a few tens of attograms [2].

References:

[1] K. Hernadi, A. Fonseca, J. B.Nagy, D. Bernaerts, A. Fudala, A.A. Lucas, Zeolites, **17** (1996) 416.
[2] A. Volodin, D. Buntinx, M. Ahlskog, A. Fonseca, J. B.Nagy, C. Van Haesendonck, Nanoletters, **4** (2004) 1775.

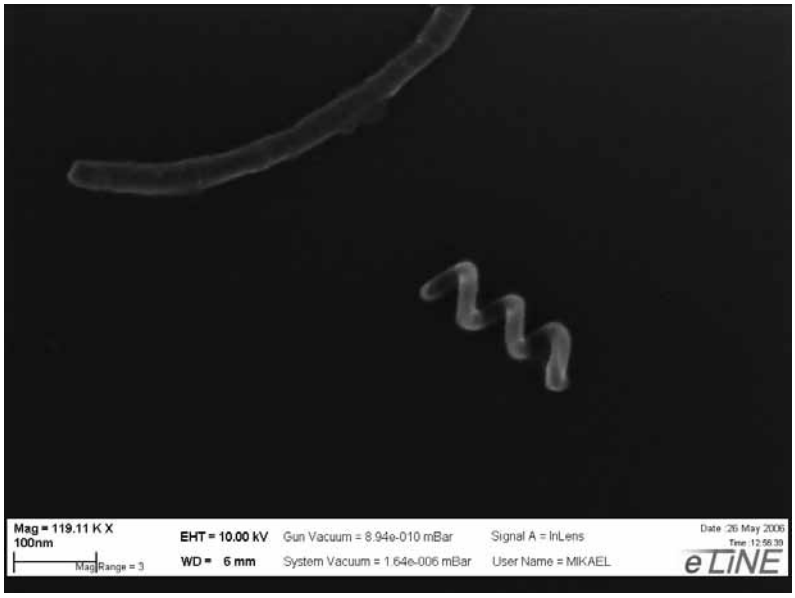

Figure 1. A SEM image of a coiled multiwalled nanotube deposited on a substrate.