41. Title: ZnO-CNT composite nanotubes as nanoresonators

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Abstract: This Letter reports the very first vibration analysis of the novel composite nanotubes (NTs) synthesized by coating carbon nanotubes (CNTs) with piezoelectric zinc oxide (ZnO). Timoshenko beam theory was used and modified to account for the interlayer van der Waals (vdW) interaction in the inner CNT and hybrid structures of the NTs. The distinctive vibration behaviours of the NTs were captured and the physics behind these unique features was investigated in terms of the critical role of the vdW interaction and the effect of the ZnO coating layer on the structural rigidity of the NTs. The composite NTs are found to be promising for gigahertz/terahertz electromechanical nanoresonators whose frequency can be even higher than that of the core CNTs.