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Metal-carbon nanotube composite nanoelectromechanical torsional resonators YOUNG DUCK KIM, SEUNG SAE HONG, JUNG HOON BAK, BYUNG YANG LEE, SUNG WOON CHO, KI SUNG SUH, SEUNGHUN HONG, YUN DANIEL PARK, Department of Physics and Astronomy, Seoul National University NS50, Seoul 151-747, Korea — Metallic based nanoelectromechanical systems (NEMS) resonator structures are of interest due to higher optical reflectivity, ductility, and conductivity compared to insulator- and semiconductor- based NEMS structures. We present NEMS torsional resonator structures fabricated from aluminum-carbon nanotube (CNT) and palladium-CNT composites. Metal and metal-CNT NEMS structures are released from III-V based substrates. The resonators are electrostatically driven and are detected at room temperatures under moderate vacuum conditions using optical modulation techniques. We note significant differences in the resonant frequencies (f_0) and the quality factors (Q) between metal and metal-CNT NEMS torsional resonators. Aluminum based structures with paddle dimensions of ∼5 micron x ∼5 micron, with support beams of ∼1 micron x ∼3 micron, show a fundamental resonant frequency corresponding to translational mode of 1.7 MHz with Q of 20, while Al-CNT based structures of same dimensions show f_0 of 3 MHz and Q of 50, as a typical example. We will further discuss the effects on the mechanical properties of metallic NEMS torsional resonators due to addition of CNT. †parkyd@phya.snu.ac.kr

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