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Application of Carbon Nanotube Assemblies for Sound Generation and Heat Dissipation MIKHAIL KOZLOV, CARTER HAINES, JIYOUNG OH, MARCIO LIMA, SHAOLI FANG, University of Texas at Dallas — Nanotech approaches were explored for the efficient transformation of an electrical signal into sound, heat, cooling action, and mechanical strain. The studies are based on the aligned arrays of multi-walled carbon nanotubes (MWNT forests) that can be grown on various substrates using a conventional CVD technique. They form a three-dimensional conductive network that possesses uncommon electrical, thermal, acoustic and mechanical properties. When heated with an alternating current or a near-IR laser modulated in 0.01–20 kHz range, the nanotube forests produce loud, audible sound. High generated sound pressure and broad frequency response (beyond 20 kHz) show that the forests act as efficient thermo-acoustic (TA) transducers. They can generate intense third and fourth TA harmonics that reveal peculiar interference-like patterns from ac-dc voltage scans. A strong dependence of the patterns on forest height can be used for characterization of carbon nanotube assemblies and for evaluation of properties of thermal interfaces. Because of good coupling with surrounding air, the forests provide excellent dissipation of heat produced by IC chips. Thermoacoustic converters based on forests can be used for thermo- and photo-acoustic sound generation, amplification and noise cancellation.

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