

Multifunctional single-walled carbon nanotube films

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The unique properties of single-walled carbon nanotube (SWNT) films, such as high porosity and specific surface area, low density, high ratio of optical transmittance to sheet resistance, high thermal conductivity and chemical sensitivity, and tunable metallic and semiconducting properties, open up a new avenue for a wide range of applications. Recently, we have developed aerosol techniques for the production of high purity SWNTs. These methods allowed us to selectively produce high quality and purity single-walled CNTs. The aerosol CVD process was shown to be able to dry-deposit large area SWCNT-networks with tuneable conductivity and optical transmittance on wide range of substrates including flexible polymers. These SWCNT-networks can be chemically doped to reach sheet resistance as low as $84 \Omega/\text{sq.}$ at 90 % optical transmittance. Wide application potential of these networks is demonstrated. Also we reported a simple and rapid method to prepare multifunctional free-standing SWNT films with thicknesses from a sub-monolayer to a few micrometres having outstanding properties for a broad range of exceptionally performing devices. We have fabricated state-of-the-art key components for nanoparticle filtration with a figure of merit of 147 Pa^{-1} , electrochemical sensors with extremely low detection limits below 100 nM, and polymer-free saturable absorbers for ultrafast femtosecond lasers. Furthermore, the films performed as the main components in gas flowmeters, gas heaters and thermoacoustic loudspeakers.

Biography

Albert Nasibulin is an Adjunct Professor at the Department of Applied Physics of Aalto University School of Science (former Helsinki University of Technology). He got his PhD in Physical Chemistry (1996) at Kemerovo State University (Russia) and Doctor of Science (Habilitation, 2011) at Saint-Petersburg Technical State University (Russia). He has specialized in the aerosol synthesis of nanomaterials (nanoparticles, carbon nanotubes and tetrapods), investigation of their growth mechanism and their applications. He has a successful background in an academic research with about 140 scientific peer-reviewed publications and 12 patents.

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