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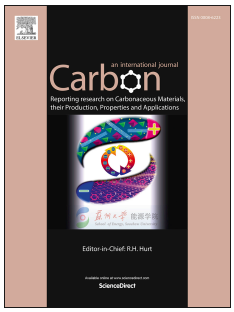


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# Transparent and Conductive Hybrid Graphene/Carbon Nanotube Films

Alexandra L. Gorkina[a], Alexey P. Tsapenko[a], Evgenia P. Gilshteyn[a], Tatiana S. Koltsova[b], Tatiana V. Larionova[b], Alexander Talyzin[c], Anton S. Anisimov[d], Ilya V. Anoshkin[e], Esko I. Kauppinen[e], Oleg V. Tolochko[b], Albert G. Nasibulin[a,e*]

[a] *Skolkovo Institute of Science and Technology, Nobel str. 3, 143026, Moscow, Russia*
[b] *Peter the Great St.Petersburg Polytechnic University, Polytechnicheskaya 29, 195251 St. Petersburg, Russia*
[c] *Umeå University, SE-901 87 Umeå, Sweden*
[d] *Canatu Ltd., Konalankuja 5, 00390, Helsinki, Finland*
[e] *Aalto University, Department of Applied Physics, 00076 Aalto, Finland*

**Abstract**

Carbon nanomaterials (carbon nanotubes (CNTs) and graphene) are promising materials for optoelectronic applications, including flexible transparent and conductive films (TCFs) due to their extraordinary electrical, optical and mechanical properties. However, the performance of CNT- or graphene-only TCFs still needs to be improved. One way to enhance the optoelectrical properties of TCFs is to hybridize CNTs and graphene. This approach leads to creation of a novel material that exhibits better properties than its individual constituents. In this work, the novel hybrid CNT-graphene nanomaterial was fabricated by graphene oxide deposition on top of CNT films. The graphene oxide was then reduced by thermal annealing at ambient atmosphere or in $H_2$ atmosphere. At the final step the CNT-graphene hybrids were chemically doped using gold(III) chloride. As a result, we show that the hybrids demonstrate excellent optoelectrical performance with the sheet resistance as low as 73 Ω/ at 90% transmittance.

* Corresponding author: +7 916 69 03 812; E-mail: a.nasibulin@skoltech.ru (Albert Nasibulin)