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Autor(en) des Beitrags: Reale, A.; Regloiosi, P.; Tocda, L.; Lugli, P.

Titel des Beitrags: Conductance modulation of single-walled carbon nanotubes

Abstract: We have performed studies on the correlation between mechanical deformation and conductivity on a set of carbon samples constituted by 70% of single-walled carbon nanotubes. The samples, in form of slabs (6 × 5 mm, thickness: 400 mm), were obtained by compacting the nanotube material at 200 and 600 bar. The changes of conductivity have been monitored by measuring the current variations induced by a modulated periodic elongation of the slabs via a coherent technique. The mechanical deformations were produced by forces applied vertically at the center of each slab, horizontally placed on a sample holder. A piezoelectric actuator controlled by a lock-in amplifier was fixed to the sample holder. The modulation of the current induced by the mechanical deformation of the nanotube slabs is huge, and the amplitude of the modulation is almost linearly proportional to the elongation induced by the piezoelectric actuator. Such change of conductivity is more than an order of magnitude higher than the change obtained by piezoelectrical deformation of Si. The behaviour of the nanotube samples has been compared to that of a reference sample made of graphite compressed at 200 bar to form a slab with similar dimensions. In this case the change of conductivity was below the sensitivity of the lock-in amplifier, which was unable to lock to the periodicity of the mechanical deformation. We are currently addressing the problem to interpret
the strong response of the nanotube slabs, which could be attributed either to a piezoresistive response of the sample or to the direct effect of the deformation on the hopping transport processes.