Nanocomposites and nanomaterials

Conductivity of a mechanical mixture $LaNi_5$ + *n* wt. % CNT

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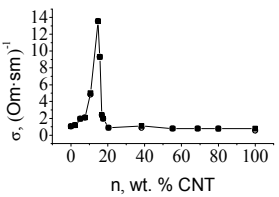
Electrical properties of the mechanical mixture $LaNi_5$ with multi-walled carbon nanotubes were investigated during deformation by compression, which leads to the establishment of electrical contact between the nanotubes, an increase in their total area, the change orientation and geometry of the nanotubes.

CNTs were grown by chemical vapor deposition (CVD) with catalyst Al_2O_3-Fe_2O_3-MoO_3, vapor C_3H_6 at a temperature of 650°C, the average diameter is d = 10 ± 2 nm. $LaNi_5$ particles were synthesized by an electric discharge in toluene, average diameter is d = 135 ± 15 mm. $LaNi_5$ have a low work function (φ = 3,6 eV) than CNT (φ = 4,7 eV).

Electrical conductivity was measured in the dielectric tube under the piston. Figure shows electrical conductivity σ as a function of CNT content in the mechanical mixture $LaNi_5$ + *n* weight.% CNT.



The conductivity of the starting components of compacted particles $LaNi_5$ is σ = 0,7 (Ohm · cm)$^{-1}$, and for compacted solid CNT- σ = 1,04 (Ohm · cm)$^{-1}$.

Increasing the concentration of nanotubes in the nanocomposite to 15 wt. % leads to an increase in the conductivity of the order and is σ = 14 (Ohm · cm)$^{-1}$, which is also an order of magnitude greater than the value σ compacted CNT, respectively, depending on σ(*n*) a sharp peak.

It is known that CNTs have low concentration of conduction electrons (n_e = 1,3 · 10^{19} cm^{-3}), but have a higher mobility (μ = 10 m^2/V · s), and metals, conversely, have a high concentration of conduction electrons (~ 10^{28}) and very low mobility (for $LaNi_5$ μ = 0,0072 m^2/V · s). Upon contact with the metal $LaNi_5$ with CNT ($\varphi_{LaNi5} < \varphi_{CNT}$), electrons will move from the metal to the CNT, increasing their

concentration.