19
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Title:Localization and electrical transport in onion-like carbon based composites
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Abstract:Electrical transport properties of onion-like carbon (OLC) based composites over a wide (20 Hz-4 THz) frequency range are reported. The dependencies of dc conductivity on temperature can be approximated by the Mott law for one-dimensional variable range hopping below 130 K and by the typical law for fluctuation induced tunneling within the range of 130-300 K. The critical frequency at low temperatures also decreases according to the Mott law for one-dimensional variable range hopping. It was demonstrated that OLC annealing temperature plays a high role on the dielectric and electrical properties of composites at low temperatures. In the terahertz frequency range, the main contribution to the complex electrical conductivity is due to the phonon contribution while the contribution from hopping conduction vanishes at these frequencies.
Number of references:20
Inspec controlled terms:annealing - carbon - composite materials - hopping conduction - localised states - permittivity - phonons - tunnelling
Uncontrolled terms:localization - electrical transport properties - onion-like carbon based composites - DC conductivity - Mott law - one-dimensional variable range hopping - fluctuation induced tunneling - critical frequency - annealing temperature - dielectric properties - electrical properties - terahertz frequency - phonon contribution - high frequency permittivity - frequency 20 Hz to 4 THz - temperature 130 K to 300 K - C
Inspec classification codes:A7220F Low-field transport and mobility; piezoresistance (semiconductors/insulators) - A7280T Electrical conductivity of composite materials - A7340G Tunnelling: general (electronic transport) - A7720 Dielectric permittivity - A8140G Other heat and thermomechanical treatments - A6320D Phonon states and bands, normal modes, and phonon dispersion

Numerical data indexing:frequency 2.0E+01 4.0E+12 Hz;temperature 1.3E+02 3.0E+02 K
Chemical indexing:C/el
Treatment:Experimental (EXP)
Discipline:Physics (A)
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