

MASTER'S THESIS

Phase transitions in solid C₆₀ doped with C₇₀: a study with dielectric spectroscopy

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Phase Transitions in Solid C₆₀ Doped with C₇₀:
A Study with Dielectric Spectroscopy

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ABSTRACT

An experimental study has been carried out into the phase transitions of C_{60} crystal grown by a diluted solution method, which allows their doping by C_{70} . The adopted doping levels were 0, 1, 2, 3 and 10 %. The phase transitions were identified from thermal analysis and dielectric spectroscopy. C_{70} was found to depress the orientational order to disorder transition temperature T_c of 260 K in pristine C_{60} , as indicated by the endothermic peak in heat-flux Differential Scanning Calorimetry thermogram, as well as by the minimum in the temperature-dependent permittivity ϵ' in dielectric spectrum. In addition, features were discerned near 90 K, which we attribute to glass transition, although on the same time scale this phase change occurs at much higher temperature as observed previously by other investigators. Significantly, the activation energy for this second-order phase change, calculated from the frequency dependent of impedance spectra, was greatly reduced at the same time. All these effects of doping with C_{70} are explained by its production of stacking faults, which has been confirmed by powder X-ray diffractometry.

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