THE VIBRATIONAL BAND ENHANCEMENTS FOR ACTIVE AND "SILENT" VIBRATIONS IN THE RAMAN AND IR SPECTRA OF FULLERENE C_{60} NANOFILMS

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S u m m a r y

A comparison of the intensities of the vibrational bands (VB) in Raman and IR spectra for nanofilms of C_{60} 150–250 nm in thickness and for microfilms 1–2 μm in thickness has been done. In the Raman spectra of nanofilms, the enhancement of the active bands $Hg(1 \div 8)$ by $2 \div 7$ times in comparison with a slight weakening of the Ag(1,2) band for microfilms has been observed. It is shown that the Raman and IR vibrations Gg,u, Hu, $F_{1,2}$g, and F_2u, which are inactive for icosahedral symmetry I_h, and the lateral spectral components of the bands $Hg(1 \div 8)$ increase by 5–50 times and more. The observed phenomena is associated with the significant changes in the electro-physical properties of nanostructured media due to a weakening of the symmetry and an increase in the anharmonicity and the nonlinear interaction of vibrational modes. During the polymerization of a nanofilm by diamine (N_2H_4), the observed enhancement of VB decreases due to a decrease in the vibrational nonlinearity. The differences between the experimental intensities of VB and the results of quantum-chemical calculations are discussed.