ABSTRACTS

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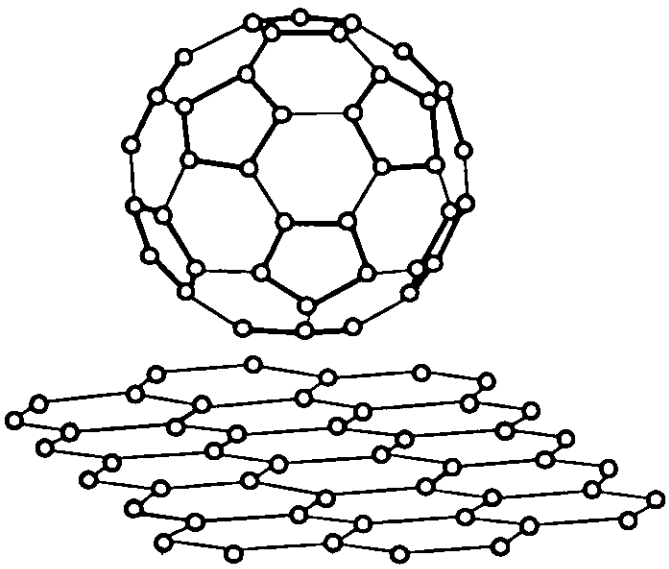

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CONDUCTION ELECTRON SPIN RESONANCE IN GRAPHITE AND IN ITS INTERCALATION COMPOUNDS

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A short review of our recent experimental and theoretical reseach work results in the field of conduction electron spin resonance (CESR) in graphite intercalation compounds (GICs) are presented with more emphasis on early unknown properties of this materials. It has been investigated the following aspects of this problem.

CESR lineshape in graphite and GICs. The experimental investigations and theoretical analysis of the effects of sample size, experimental conditions (electromagnetic configuration, constant magnetic field orientation and modulation frequency, temperature) and the stage index number (n) on the lineshape and intensity of the CESR were performed in graphite and its acceptor intercalation compounds. A new procedure is developed for analyzing the CESR line shape in graphite and GICs plates, which takes into account the induced nonuniformity of microwave field near the surfaces of plates. By using this procedure we determined the kinetic parameters of the spin and current curriers parallel and perpendicular to the carbon layers and estimated the density of states at the Fermi level.

CESR and phase transitions in GICs. A detailed CESR analysis of intercalate melting (or crystallization) transition and dependence of its characteristics on intercalate sublattice dimension (on "n") are carried out. As a result, in $C_{5n}HNO_3$ (n = 2,3,4 and 7) we have found: two-step nature of the 2D-intercalate layers melting; "global" temperature hysteresys of the melting-crystallization process; larger T_c for a larger "n" in a series of samples with even (or odd) index; decrease of density and increase of mobility of spin carriers at intercalate melting and, simultaneously, step-wise decrease of planar and c-axis conductivity. Basing on obtained data we proposed that the increase of CESR linewidth (the decrease of spin-lattice relaxation time) in GICs during the lowering of its temperature (the "nonmetallic" behaviour) is due to the decrease of conductivity relaxation time and set up a model for a 2D-melting in GICs.

CESR and physical reasons of graphite intercalation. We carried out an *in situ* CESR study of the intercalation of SbF_5, MoF_5, HNO_3, Br_2 and F_2 molecules into graphite plates. The application of the new procedure of this experiments allows to find and study: individual reaction steps, including unknown one; constants of the 2D diffusion of the intercalate through the sample after insertion of it into graphite; the rate of stage index change front advance occuring at the interface between initial and previous stages. The obtained data have been successfully applied to the elaboration of a theory of physical reasons of graphite intercalation.