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Influence of spin-orbit interaction on magnetic properties of fullerenes

Elena V Orlenko

Peter the Great St. Petersburg Polytechnic University, Russia

The current paper is devoted to the consideration of sp^2 -carbonaceous fullerenes molecules in homogeneous magnetic field. Due to reduction system symmetry in magnetic field to the axial type, the energy splitting gives rise to forming dominant atomic structures in fullerenes molecule with local symmetries. Spin-orbit interaction plays a crucial role in this phenomenon. The current paper is aimed at determination of such spin-orbit coupling parameters as energy E_{so} and constant a_{so} as well as g -factors Landé for magnetization study of the C_{60} -based compounds in magnetic field. Magnetization study of the C_{60} -based compounds in magnetic field for a wide temperature range demonstrate an amazing feature of its behavior, such as a reduced Landé g -factor values $g < 1$. It is shown in experiments a variability of fullerene C_{60} g -factor in the course of magneto-optical study at pulsed magnetic field up to 32 T in the frequency range $\nu = 60-90$ GHz at $T = 1.8$ K. There are three values of g -factors: namely: $g_1 = 0.43 \pm 0.03$; $g_2 = 0.27 \pm 0.02$ and $g_3 = 0.19 \pm 0.01$. Such experiments give rise to assume 1) the availability of existence of three different independent configurations of local spins in the molecule; 2) the influence of the spin-orbit coupling onto forming the Eigen state with determined total angular momentum. There are three dominant symmetric atomic groups of C_{60} - Y_h corresponding to the polar point groups (C_{3v} , C_3 , C_{2v} , C_2 , C_s , C_1), which respond to a magnetic field: 1) a hexagon-faces 2) edges (double bonds, lying on the circle about the direction of magnetic field); 3) vertices (of pentagons, transited about magnetic field direction).

Biography

Elena V Orlenko has completed her PhD from St. Petersburg State Polytechnic University. She is full Professor for the Theoretical Physics Department and Director of a research team focusing on spin ordering in the system of identical particles with "high" spins and scattering processes of atomic particles with electron exchange at the Peter the Great St. Petersburg Polytechnic University. Her research interests include magnetic properties of low dimension atomic Bose- and Fermi-gases with "high"-spins of particles, magnetic properties and magnetic ordering in the system of "high" spin particles, exchange and super-exchange interaction in many fold centered atomic systems and developing the formalism of exchange perturbation theory, scattering processes of atomic particles with electron exchange, invariant exchange perturbation theory and super-radiation phenomena of the multi-level atomic systems

eorlenko@mail.ru

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