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Breathing crystals-P, T-induced dynamics of heterospin crystals

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The results of studies of magnetostructural correlations inherent in heterospin coordination compounds of transition metals with stable nitroxides were discussed. When the temperature changes, the compounds undergo structural rearrangements accompanied by magnetic effects similar to spin crossover. The magnetic effects that appear as a result of the structural rearrangement of the crystal are determined by the spatial dynamics of the coordination units containing exchange clusters (Jahn-Teller metal ion-coordinated organic radical) and generally involve considerable changes in the crystal volume during repeated cooling-heating cycles. Mechanical stability of heterospin crystals are capable of being reversibly compressed, and expand during multiple crossing of the temperature range of the phase transition region which is reflected by the term "breathing crystals." The plasticity of the single crystals allows studies of reversible SC–SC phase transformations over a wide temperature range (30°-300° K), the creation of X-ray cinema, and analysis of structural transformations in the four-dimensional space (coordinates + temperature). The report discusses methods of control over the character and temperature of spin transition for compounds from this class. The effect of a change in the external pressure on the character of the temperature dependence of the effective magnetic moment was also discussed. The phase transformation of the heterospin compound caused by its cooling may be accompanied by deep coloring of the solid phase, which is an unusual effect. The possibility of creating spin devices whose working mechanism (unit) is an exchange cluster, that changes multiplicity under the action of temperature, pressure, or light was discussed.

Biography

Victor Ovcharenko is the Head of Multispin Coordination Compounds Laboratory at the International Tomography Centre. He has published more than 200 papers in reputed journals (coordination chemistry of free radicals, design of molecular magnets, spin transitions).

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