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The difference in the P- and T-induced dynamics in breathing crystals

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Reactions between the paramagnetic transition metal ions and nitroxides are convenient and effective methods for the preparation of heterospin crystals. The presence of several paramagnetic centers in heterospin molecules stirred the growing interest in their magnetic properties because these compounds are convenient objects for studying the fine distinctions in exchange interaction channels and revealing valuable magneto-structural correlations. When the temperature (or pressure) changes, the solid compounds undergo structural rearrangements accompanied by magnetic effects similar to spin crossover. The observed anomalies are caused by the reversible spatial dynamics of Jahn-Teller coordination units. The high mechanical stability of the crystals, i.e., their ability of being reversibly compressed and expanded in the temperature range of phase transition, underlies the term breathing crystals. When the cooling–heating cycles are repeated in the range 5-325 K the phase transformations of the heterospin crystals may be accompanied by deep coloring of the solid phase, which is an unusual effect. The possibility of creating spin devices whose working unit is an exchange cluster that changes multiplicity under the action of temperature, pressure, or light was discussed. The effect of a change in the external pressure on the character of the temperature dependence of the effective magnetic moment is discussed. Noteworthy, external pressure variation and temperature variation have essentially different effect on the magneto-structural correlations.

Biography

Victor Ovcharenko has his expertise in design of molecular magnets and investigation of spin transitions, "breathing crystals" and magneto-structural correlations in heterospin compounds. He developed new methods of selective synthesis of highly dimensional heterospin systems based on metal complexes with stable organic radicals, investigated magneto-structural correlations inherent in heterospin compounds, created a new type of breathing crystals and explained mechanical activity of these crystals (breathing crystals, jumping crystals, dancing crystals).

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