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**Exchange and Magnetic Anisotropic Interactions of Magnetic Ions in Antiferromagnetic Materials** ALEXANDER BAZHAN, P.L. Kapitza Institute for Physical Problems, RAS, Kosygin str, 2, Moscow, Russia — Investigations of exchange and magnetic anisotropic interactions, based on materials crystallographic and magnetic symmetry, introducing quadratic forms of thermodynamic potentials, invariant with respect to operations of magnetic symmetry groups and presented in irreducible representations of interacting ions magnetic moments, are in discussions in connection with considerations of symmetric, Anderson exchange interactions, based on Hubbard Hamiltonians, that indicates dependencies of symmetric exchange on electrons transferrings between magnetic, nonmagnetic ions, electrons kinetic energy, Coulomb interactions and, determined by crystal fields, energy levels. As example, according to symmetry for some rhombohedral structures, spin Hamiltonians of symmetric, Anderson and antisymmetric, Dzyaloshinskii-Moria exchange,  $H_{ex} = \sum_{ij} J_{ij}(\mathbf{S}_i \mathbf{S}_j) - \sum_{ij} D_{ij,z}(\mathbf{S}_{ix} \mathbf{S}_{jy} - \mathbf{S}_{iy} \mathbf{S}_{jx})$ , with  $D_{ij,z}$  in abs values. Magnetic field dependencies of separate, three components of samples magnetic moments of vector v.s.magnetometer, indicating magnetic moments orientations, present direct information about interactions of magnetic ions, especially with high spin orbit interactions.

Alexander Bazhan  
P.L. Kapitza Institute for Physical Problems,  
RAS, Kosygin str, 2, Moscow, Russia

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