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Spin exchange between charged paramagnetic particles in dilute solutions

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Abstract

© Springer-Verlag Wien 2014. Kinetic equations for the spin density matrix which take into account binary collisions and a method of calculating the spin exchange effective radius have been generalized to the case of dilute solutions of charged paramagnetic particles. The effective radius of the spin exchange and rate constant of the bimolecular spin exchange between charged paramagnetic particles in solutions have been calculated numerically. Calculations have been performed under the assumption that the exchange interaction is isotropic and decays exponentially with the increase in the distance between radicals, and the solution has a given dielectric permittivity and Debye screening radius. Dependences of the spin exchange rate constant on the mutual diffusion coefficient, exchange and electrostatic interactions parameters have been found numerically. The theory has been applied to experimental results taken from the literature. The rate constant of the spin exchange between radicals of like charge found from the experiment and calculated within the developed theory are in good qualitative agreement.

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