

NMR RELAXOMETRY: SPIN-LATTICE RELAXATION TIMES IN THE LABORATORY FRAME VERSUS THE SPIN-LATTICE RELAXATION TIMES IN THE ROTATING FRAME

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The term « NMR relaxometry » is related to the determination of relaxation rates as a function of the NMR measurement frequency (or, equivalently, as a function of the static magnetic field value). The results are generally presented in the form of “dispersion curves”. It has proven to be a powerful tool for the identification and characterization of mobility within complex systems. However, as far as proton NMR is considered, dispersion curves usually start around a few kHz and thus present a gap in the very low frequency range.

This study deals on a possible way to fill this gap through the measurement of the spin-lattice relaxation rate in the rotating frame. It turns out however that the spin-lattice relaxation rate (R_1) and the spin-lattice relaxation rate in the rotating frame ($R_{1\rho}$) do not exhibit the same dependence with respect to spectral densities. In order to connect them, two mechanisms are considered: i) randomly varying magnetic fields, ii) dipolar interaction within a system of two equivalent spins. Data are obtained from two examples: one concerning a solvent in interaction with the surface of an organogel, the other with the different types of water in a mesoporous medium.

It appears that both sets of data (R_1 and $R_{1\rho}$) can be perfectly linked if a random field mechanism is assumed.