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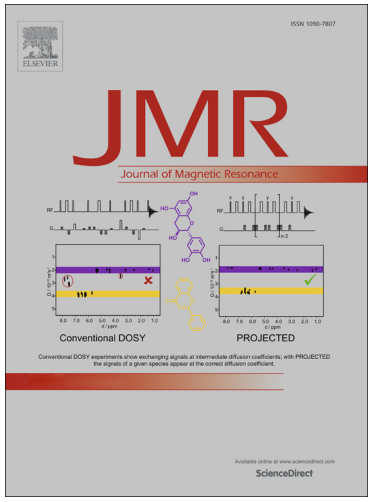

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Milli-Tesla NMR and Spectrophotometry of Liquids Hyperpolarized by Dissolution Dynamic Nuclear Polarization

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Abstract

Hyperpolarization methods offer a unique means of improving low signal strength obtained in low-field NMR. Here, simultaneous measurements of NMR at a field of 0.7 mT and laser optical absorption from samples hyperpolarized by dissolution dynamic nuclear polarization (D-DNP) are reported. The NMR measurement field closely corresponds to a typical field encountered during sample injection in a D-DNP experiment. The optical spectroscopy allows determination of the concentration of the free radical required for DNP. Correlation of radical concentration to NMR measurement of spin polarization and spin-lattice relaxation time allows determination of relaxivity and can be used for optimization of the D-DNP process. Further, the observation of the nuclear Overhauser effect originating from hyperpolarized spins is demonstrated. Signals from ^{1}H and ^{19}F in a mixture of trifluoroethanol and water are detected in a single spectrum, while different atoms of the same type are distinguished by *J*-coupling patterns. The resulting signal changes of individual peaks are indicative of molecular contact, suggesting a new application area of hyperpolarized low-field NMR for the determination of intermolecular interactions.

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