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Influence of ^{13}C isotopic labeling location of ^{13}C DNP of acetate using TEMPO free radical CHRISTOPHER PARISH, PETER NIEDBALSKI, LLOYD LUMATA, University of Texas System — Dynamic nuclear polarization (DNP) via the dissolution method enhances the liquid-state magnetic resonance (NMR or MRI) signals of insensitive nuclear spins by at least 10,000-fold. The basis for all these signal enhancements at room temperature is the polarization transfer from the electrons to nuclear spins at cryogenic temperature and high magnetic field. In this work, we have studied the influence of the location of ^{13}C isotopic labeling on the DNP of sodium acetate at 3.35 T and 1.4 K using a wide ESR linewidth free radical 4-oxo-TEMPO. The carbonyl [1-^{13}C]acetate spins produced a polarization level that is almost twice that of the methyl [2-^{13}C]acetate spins. On the other hand, the polarization of the methyl ^{13}C spins doubled to reach the level of [1-^{13}C]acetate when the methyl group was deuterated. Meanwhile, the solid-state nuclear relaxation of these samples are the same and do not correlate with the polarization levels. These behavior implies that the nuclear relaxation for these samples is dominated by the contribution from the free radicals and the polarization levels can be explained by a thermodynamic picture of DNP.

Christopher Parish
University of Texas System

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