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Producing >60,000-fold room-temperature ^{89}Y NMR signal enhancement[1] LLOYD LUMATA, ASHISH JINDAL, MATTHEW MERRITT, CRAIG MALLOY, A. DEAN SHERRY, ZOLTAN KOVACS, UT Southwestern Medical Center — ^{89}Y in chelated form is potentially valuable in medical imaging because its chemical shift is sensitive to local factors in tumors such as pH. However, ^{89}Y has a low gyromagnetic ratio γ_n thus its NMR signal is hampered by low thermal polarization. Here we show that we can enhance the room-temperature NMR signal of ^{89}Y up to 65,000 times the thermal signal, which corresponds to 10 % nuclear polarization, via fast dissolution dynamic nuclear polarization (DNP). The relatively long spin-lattice relaxation time T_1 ($\sim$500 s) of ^{89}Y translates to a long polarization lifetime. The ^{89}Y NMR enhancement is optimized by varying the glassing matrices and paramagnetic agents as well as doping the samples with a gadolinium relaxation agent. Co-polarization of ^{89}Y-DOTA with a ^{13}C sample shows that both nuclear spin species acquire the same spin temperature T_s, consistent with thermal mixing mechanism of DNP. The high room-temperature NMR signal enhancement places ^{89}Y, one of the most challenging nuclei to detect by NMR, in the list of viable magnetic resonance imaging (MRI) agents when hyperpolarized under optimized conditions.

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