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Production and NMR signal optimization of hyperpolarized 13C-labeled amino acids CHRISTOPHER PARISH, PETER NIEDBALSKI, SARAH FERGUSON, ANDHIKA KISWANDHI, LLOYD LUMATA, University of Texas at Dallas — Amino acids are targeted nutrients for consumption by cancers to sustain their rapid growth and proliferation. 13C-enriched amino acids are important metabolic tracers for cancer diagnostics using nuclear magnetic resonance (NMR) spectroscopy. Despite this diagnostic potential, 13C NMR of amino acids however is hampered by the inherently low NMR sensitivity of the 13C nuclei. In this work, we have employed a physics technique known as dynamic nuclear polarization (DNP) to enhance the NMR signals of 13C-enriched amino acids. DNP works by transferring the high polarization of electrons to the nuclear spins via microwave irradiation at low temperature and high magnetic field. Using a fast dissolution method in which the frozen polarized samples are dissolved rapidly with superheated water, injectable solutions of 13C-amino acids with highly enhanced NMR signals (by at least 5,000-fold) were produced at room temperature. Factors that affect the NMR signal enhancement levels such as the choice of free radical polarizing agents and sample preparation will be discussed along with the thermal mixing physics model of DNP.
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