Liquid-State 13C Polarization of 30% through Photoinduced Nonpersistent Radicals - DTU Orbit (28/12/2018)

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Hyperpolarization via dissolutiondynamic nuclear polarization(dDNP) is crucial to significantly increasing the magnetic resonanceimaging (MRI) sensitivity, opening up in vivo real-time MRI using 13C-labeled substrates. The range of applications, however, is limited by the relatively fast decay of the nuclear spin polarization together with the constraint of having to polarize the spins near the MRI magnet. As recently demonstrated, the employment of UV-induced nonpersistent radicals represents an elegant solution to tackling these drawbacks. Nevertheless, since its introduction, the spread of the technique has been prevented by the relatively low achievable polarization, slow buildup time, and time-consuming sample preparation. In the present work, thanks to a thorough investigation of the radical generation step, we provide a robust protocol to enhance the efficiency and performance of the UV-radical technique. Under optimal conditions, it was possible to produce up to 60 mM radical in less than 5 min and reach maximum DNP enhancement with a buildup time constant of approximately 25 min at 6.7 T and 1 K, resulting in 30% 13C liquid-state polarization.

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