Liquid-State 13C Polarization of 30% through Photoinduced Nonpersistent Radicals - DTU Orbit (18/08/2019)

Liquid-State $^{13}$C Polarization of 30% through Photoinduced Nonpersistent Radicals

Hyperpolarization via dissolutiondynamic nuclear polarization(dDNP) is crucial to significantly increasing the magnetic resonanceimaging (MRI) sensitivity, opening up in vivo real-time MRI using $^{13}$C-labeled substrates. The range of applications, however,is limited by the relatively fast decay of the nuclear spin polarizationtogether with the constraint of having to polarize the spins nearthe MRI magnet. As recently demonstrated, the employment of UV-inducednonpersistent radicals represents an elegant solution to tacklingthese drawbacks. Nevertheless, since its introduction, the spreadof the technique has been prevented by the relatively low achievablepolarization, slow buildup time, and time-consuming sample preparation. In the present work, thanks to a thorough investigation of the radicalgeneration step, we provide a robust protocol to enhance the efficiencyand 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 ofapproximately 25 min at 6.7 T and 1 K, resulting in 30% $^{13}$C liquid-state polarization.