3D ^{15}N visualization of a drug hyperpolarized by SABRE approach

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Biomedical studies use magnetic resonance imaging (MRI) as a non-destructive and non-invasive tool for visualization of internal organs and tissues, and of metabolic processes in living bodies. The main limitation of MRI is its sensitivity because of small nuclear spin polarization. This problem can be solved using hyperpolarization (HP) methods. One of such methods is signal amplification by reversible exchange (SABRE). SABRE-based approaches allow one to perform heteronuclear MRI of heterocyclic compounds, e.g., vitamin B3 [1] or fampridine [2], despite the fact that conventionally heteronuclei are not used for signal detection because of their low gyromagnetic ratio and natural abundance.

In this work, we used ^{15}N-labeled fampridine hyperpolarized by SABRE-based approach for 2D and 3D ^{15}N MRI. Fampridine has therapeutic value (it treats symptoms of multiple sclerosis). As a result of HP, we obtained ^{15}N signal intensity enhancement ε = 2000 in a magnetic field of 9.4 T. Also, we compared the values of ε achieved for ^{15}N-labeled and non-labeled fampridine. While ε is higher for non-labeled substrate, molar polarization is higher for the ^{15}N-labeled one. High values of signal intensity allowed us to perform 3D ^{15}N MRI with signal-to-noise ratio of up to 90.

Implementation of HP methods for heteronuclear MRI expands the range of MRI applications, e.g., real-time monitoring of metabolism or differentiation of normal and cancerous/necrotic tissues.

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[1] A.I. Svyatova, I.V. Skovpin, et al., *Chem. Eur. J.* **2019,** *25 (36),* pp. 8465-8470.

[2] I.V. Skovpin, A.I. Svyatova, et al., *Chem. Eur. J.* **2019,** *25 (55),* pp. 12694-12697.