Signal amplification by reversible exchange (SABRE)

Signal amplification by reversible exchange (SABRE) was first reported by the group of Duckett in 2009.[1] At that time, the use of *para*hydrogen as a source of polarisation centred on incorporating it in to an unsaturated molecule via a hydrogenation reaction. SABRE changed the landscape of *para*hydrogen-based hyperpolarisation by facilitating a route to polarise a molecule without chemical change occurring. Initially *N*-heterocycles were solely utilised as the polarisation acceptor but recent advances have extended this method to include molecules that possess functional groups such as carboxylic acids and alcohols, as the recipients of polarisation.

The rapid development of SABRE over the last decade has been recently recognised in that Professors Duckett, Ivanov, and Warren were jointly awarded the Günther Laukien Prize in 2020 for their outstanding contribution to this area. Two of these recipients, Professors Duckett and Ivanov, have contributed articles to this special issue. Their SABRE-focused research articles report on the steric and electronic effects on the ^{1}H hyperpolarisation of substituted pyridazines and the simultaneous ^{15}N polarization of several biocompatible substrates in ethanol–water mixtures, respectively.

Sadly, during the production of this special issue, the community learned of the untimely passing of Professor Konstantin Ivanov. Professor Ivanov contributed significantly to the theoretical underpinning of SABRE and published extensively in this area, as well as on other hyperpolarisation techniques. His PhD mentor, and colleague, Professor Nikita Lukzen has penned a dedication to Professor Ivanov that is included in this special issue.

In addition to the aforementioned two research articles, this special issue includes a further five research articles and one application note. The application note, contributed by Chekmenev *et al*., discusses the use of magnetic shielding in *para*hydrogen hyperpolarization experiments to obtain less than 20 nT residual magnetic fields in a relatively inexpensive fashion.

The hyperpolarization of common antifungal agents by SABRE is featured in the work by Theis *et al*. The focus on biological relevant molecules is continued by Roy *et al.* in their work on the ^{15}N hyperpolarisation of the antiprotozoal drug ornidazole in aqueous medium. An approach to fast 2D nuclear magnetic resonance at low concentration based on *para*hydrogen-induced polarization and non-uniform sampling is reported by Tessari *et al*., whereas Barskiy *et al*. detail large-scale steady-state enhanced nuclear magnetization with *in situ* detection. A final research article by Adams *et al.* focuses on the use of SABRE to enhance signals in real-time pure shift NMR spectroscopy, using a mixture of pyridine and (-)-cinchonidine to exemplify the method.

These articles provide a wealth of information to researchers who have an interest in SABRE or other hyperpolarisation methods. These articles also illustrate the diversity of current developments that utilise SABRE and how some of the challenges surrounding SABRE are being overcome.

In closing, I would like to thank all the authors, and reviewers alike, who kindly agreed to contribute to this issue. Without them, this special issue would not have been possible. Additionally, I would like to thank Professors Craig Butts and David Rovnyak (MRC Special Issues and Features Editors) who have afforded me so much of their time to guide me through the process of acting as an editor for this special issue. I would also like to extend my thanks to Paul Trevorrow (Wiley Managing Editor), Dr Sarah Ryan (Journal Administrator) for their help and the Editors-in-Chief, Roberto Gil and Gary Martin for affording me the opportunity to edit this special issue.

1. R. W. Adams, J. A. Aguilar, K. D. Atkinson, M. J. Cowley, P. I. P. Elliott, S. B. Duckett, G. G. R. Green, I. G. Khazal, J. Lopez-Serrano and D. C. Williamson, *Science*, 2009, **323**, 1708-1711.