Magn. Reson. Discuss.,
https://doi.org/10.5194/mr-2020-2-RC2, 2020

MAGNETIC RESONANCE
Open Access
Discussions

Interactive comment on "Highly Stable Magic Angle Spinning Spherical Rotors Lacking Turbine Grooves" *by* Thomas M. Osborn Popp et al.

Anonymous Referee #2

Received and published: 14 April 2020

General Comments:

The authors examine and discuss factors important for fast, stable spinning of spherical rotors for magic angle spinning solid-state NMR experiments. They show that a stator for spherical rotors can be integrated into a commercial NMR probehead in a straightforward manner. They present measurements of spinning speeds and spinning stability achieved with eight different turbine groove designs, including one design with no grooves. The spinning rate achieved at a given pressure is shown to be sensitive to the surface grooves, with moderate spinning rate improvements observed for some groove geometries over others, and over a smooth rotor. Finally, they present a theoretical motivation for the spinning stability they observed in spherical rotors based on an analysis of the principal values of a spherical rotor's moment of inertia tensor.

Printer-friendly version

Discussion paper

The results presented here are broadly interesting to the solid-state NMR community. Spherical rotors represent an alternative to the conventionally used cylindrical rotors, with several potential benefits which the authors outline. While much development work is still necessary, this work reports progress which is likely to spur further investigation into spherical rotors, and into other alternative rotor designs.

Specific Comments:

It would be interesting to hear comments about how spherical rotor stability is influenced by the sample, beyond what was included at the end of the manuscript. NMR data acquired on a sample spun in rotor H were acquired with a 3.5 kHz spinning speed, which is below the maximum spinning speed reported for rotor H in Figure 3a. Was 3.5 kHz chosen for stability reasons?

Was any consideration given when designing deep turbine grooves to how these grooves might alter the moment of inertia tensor of the spherical rotors?

Technical corrections:

The formatting of several of the references is somewhat strange, with the doi appearing twice in multiple references.

Interactive comment on Magn. Reson. Discuss., https://doi.org/10.5194/mr-2020-2, 2020.