Magn. Reson. Discuss.,
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Open Access MAGNETIC RESONANCE Discussions

Interactive comment on "Open-source, 3D-printed, high-pressure (50 bar) liquid-nitrogen-cooled *para*-hydrogen generator" *by* Frowin Ellermann et al.

James Eills (Referee)

eills@uni-mainz.de

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This work describes the construction and operation of a high-pressure parahydrogen generator, and the authors list in detail the required equipment, costs, safety considerations, and provide a discussion of the advantages/disadvantages of this system. Overall this is a nice addition to the literature, and I expect this piece of work will prove to be a useful tool for researchers wanting to bring PHIP+SABRE experiments to their laboratory, or upgrade their current equipment at low cost. This work is especially useful as the system is capable of operating at 100 bar H_2 pressure, which exceeds the typical gas pressures reported in PHIP/SABRE experiments; this will likely be an

important step forward for the field in the quest for ever-higher polarization levels and reduced reaction times.
I support publication of this paper after some minor corrections, which I hope the authors will find helpful:
Title: "3D-printed" should be removed from the title or clarified as "partially 3D printed" (or similar), as this is misleading in its current form.
Line 40: The authors might choose to also mention long-lived spin isomers in methyl rotors, e.g. doi: 10.1021/ja410432f
Line 113: Can the authors make any comment about how well the cotton wool works in preventing iron oxide flow through the system, or state how much was used for effective filtering?
Line 141: It would be helpful to briefly state how inductive and static spark charges are avoided.
Line 265: I'm a little bit confused about the reporting of P_{out}, doesn't this value vary in time? Does P_{in} describe the gas pressure in the catalyst region? Isn't this the only relevant pressure when considering conversion as a function of flow rate?
Lines 343-344: But the quantification *is* performed on a high-field NMR system. Better to say "We have shown that routine pH_2 quality control can be performed with a low-cost benchtop NMR system", or similar..
Lines 347-351: I don't understand the value "points loss of f_{pH_2} per week". A relaxation time is given to describe the exponential process and this should be sufficient to understand the f_{pH_2} change each week. Unless I've misunderstood, I suggest simply removing this.
Line 348: "With $\sim$120 days of lifetime, Hövener et al. reported even longer values (2013)." The phrasing of this sentence is a little strange.
Line 349: It would be helpful to explain why vacuuming the cylinder should lead to a longer pH_2 lifetime (presumably due to removal of paramagnetic oxygen molecules).
Figure 7: It would be informative to include an additional plot showing para-enrichment level as a function of pressure (P_{in}) for a 2 SLM flow rate. This is a suggestion and I

do not insist on this for publication.
In another interactive comment, Prof. Igor Koptyug has provided two references to other parahydrogen generators described in the literature. I agree that this closely-related work should be cited.

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