

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

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Dear referee,

We thank you for your valuable comments. We appreciate that you've read the manuscript thoroughly. Overall, we implemented all your comments, and in the following, we want to provide a point-by-point response.

Your comment: "In particular, Page 2, line 46: '0Z axis'? Should it be Z axis?"

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Answer: As proposed, we changed "OZ axis" to more common "Z axis" in the text

Your comment: "Page 4, line 84: 'don't require much in terms of service' - poor word choice."

Answer: We agree and modified the sentence. Actually, the point here is that these setups don't require the supply cryogenes.

Old text: "These setups work reliably and don't require much in terms of service (e.g. no liquid cryogenes)."

New text: "These setups work reliably and don't require a supply of liquid cryogenes."

Your comment: "Page 4, line 90: 'were performed ... - and still are poor word choice."

Answer: We modified the sentence and removed "still are".

Old text: "Indeed, much of the initial studies were performed with IN₂-based PHGs - and still are (Kiryutin et al., 2017; Meier et al., 2019)."

New text: "Indeed, IN₂-based PHGs are still used in many studies (Kiryutin et al., 2017; Meier et al., 2019)"

Your comment: "Page 4, line 95: 'way beyond' - poor word choice."

Answer: We agree that it is colloquial and we removed "way" from the sentence.

Your comment: "Page 5, line 113: 'Iron (III) oxide' - should be hydrated iron oxide or FeO(OH)."

Answer: We agree and changed it to the more specific name "Fe(OH)O".

New text: "About 1.5 ml granular Fe(OH)O (371254-50G, Sigma-Aldrich, St. Louis, U.S.A.) was filled into the coil."

Your comment: "Page 8, line 183: should 'norm' stand for normal pressure and

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temperature (not standard)? See, for example, https://www.engineeringtoolbox.com/stp-standard-ntp-normal-air-d_772.html

Answer: We understand that "stand" is a better choice as an index. Therefore, we substituted "norm" by "stand" everywhere, i.e. " p_{norm} " by " p_{stand} "

Old text: "[...] where T_{rt} is the temperature of the quantification experiment (here: 22 °C) and 'norm' stands for standard pressure and temperature values ($p_{norm} = 10^5$ pascals = 1.0 bar, $T_{norm} = 273.15$ K) (Nic et al., 2009)."

New text: "[...] where T_{rt} is the temperature of the quantification experiment (here: 22 °C) and 'stand' stands for standard pressure and temperature values ($p_{norm} = 10^5$ pascals = 1.0 bar, $T_{stand} = 273.15$ K) (Nic et al., 2009)."

Your comment: "Page 10, line 227: '250 mm internal diameter, 360 mm outer diameter' - numbers seem too big, please check."

Answer: You are absolutely right! We corrected the unit "mm" to " μm ".

New text: "The only modification was that a hollow optical fibre (Molex, part. num. 106815-0026, 250 μm internal diameter, 360 μm outer diameter) was glued to the end of the PTFE capillaries to reduce magnetic field distortions."

Your comment: "Page 11, line 253: 'These collisions'?"

Answer: We changed the paragraph in a way, that the choice of word and structure is more appropriate.

Old text: "The flow rate is an important parameter since it affects the collisions of H_2 with the catalyst in the ortho-para conversion unit (Fig. 3, A3). At optimal parameters, IN_2 based PHG can provide $f_{p\text{H}_2} = 52$ % (Fig. 2,7b). These collisions are responsible for the fast ortho-para conversion"

New text: "The flow rate is an important parameter since it affects the amount of H_2 collisions with the catalyst in the ortho-para conversion unit (Fig. 3, A3) that enables fast para-ortho-conversion. A IN_2 -based PHG can provide $f_{p\text{H}_2} = 52$ % at maximum

(Fig. 2,7b)."

Your comment: "Page 11, line 259: 'ad-hoc' is used improperly in this sentence."

Answer: We agree that "ad-hoc" is not the right word in this context. We modified the sentence.

Old text: "This flow rate was fast enough for convenient ad-hoc pH_2 production."

New text: "This flow rate was fast enough for a convenient pH_2 production."

Your comment: "Page 12, line 269 and 273: errors and mean values should have the same number of significant figures, i.e., either 51.50(36) or 51.5(4)"

Answer: We totally agree and changed all results in the manuscript to the format $XX,X \pm X,X$.

Old text (e.g.): "The average f_{pH_2} was found to be (51.5 ± 0.36) %, corresponding to a coefficient of variation (CV) of 0.7 % (Fig. 8)."

New text: "The average f_{pH_2} was found to be (51.5 ± 0.4) %, corresponding to a coefficient of variation (CV) of 0.7 % (Fig. 8)."

We hope, that we could address all your comments appropriately.

With kind regards,
Frowin Ellermann and Jan-Bernd Hövener

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