

# Review of: "Flow Batteries From 1879 To 2022 And Beyond"

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First of all, I would like to congratulate the author for the significant effort gathering all these references, patents and search engines comparison. I have really enjoyed reading about the history of Redox Flow Batteries (RFB), specially how political/historical events have contributed to the development of the different technologies commented in this review.

I would really appreciate an editorial review. Figures 1 and 11a do not appear in the pdf version. Figure 4 should be redone cause even in the online version is hardly readable. Some of the symbols like ( $p$  pressure,  $u$  linear flow velocity,  $v$  volumetric flow velocity) and equations appear dashed, please be careful and consistent with the format (could it be a problem of the uploading process?). The paragraph "On the other hand, high-area electrodes with submicron pores..." Page 13 is not justified. Furthermore, some typos can be found along the text, please carefully check the manuscript.

I really appreciate the new section of polysulfide-polybromide flow batteries. In this work, AORFB are completely neglected. I would find really interesting a section where AORFB publications and patents were compared with VRFB ones from the bibliometric point of view.

It is stated in page 7 "*Modern Zn-Br<sub>2</sub> flow batteries typically operate at low current densities around 20-100 mA/cm<sup>2</sup> (cycle energy efficiency < 75 %) to avoid the dormation of Zn dendrites*" Which is the problem of Zn dendrites? I suggest a brief explanation about the formation process of these dendrites and more important, the effect in the battery's performance. Dendrites formation lead to short circuit, increase the specific surface area of the zinc electrode, facilitate zinc corrosion, reduce the utilization rate of zinc as well as increase the capacity loss due to the dead Zn formation).

It could be very interesting matching the different fiber diameter reported in Figure 9 with the resistance observed. For example, using different colors (first generation ASR 5 ohm·cm<sup>2</sup>, second period ASR 0.5 and submicron electrode fiber diameter). In all these considerations the contribution of the ion exchange membrane have been neglected. If so, please comment it briefly.

Lithium-ion batteries are stated as the "*leading contenders among-batteries with solid electroactive materials for stationary energy storage markets*" but nothing related with the availability of the lithium is mentioned (see H. Vikström et al. / Applied Energy 110 (2013) 252–266). From a realistic point of view, the annual production rates of lithium can not meet the growing demand for enabling the electrification of road transports and the energy storage.

My general conclusion on the paper is that I would add a brief section where AORFB and VRFB were compared. Since the whole history and development of RFB have been depicted in this work, AORFB can not be neglected. One way to do

that could be removing the appendices A, B, C, D and the section 4 (creating a new modelling paper about electrodes in RFB) and adding this new comparative section. After considering my recommendations, I would really recommend this article cause it represent a well-structured review of the RFB history.