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NUMERICAL SIMULATION OF THE MECHANICAL PERFORMANCE OF SOEC STACKS: CURRENT PRACTICES AND FUTURE CHALLENGES

1200 – INDUSTRIAL APPLICATIONS

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ABSTRACT

Powered by electricity from renewable sources, Power-to-X (PtX) technologies can decouple the production of fuels and chemicals from fossil resources and are thus today the focus of development policies both at the transnational and national level. The fundamental process enabling PtX solutions is the electrolysis of steam and/or carbon dioxide [1] and several private actors are making significant investments to bring viable electrolysis technologies to market. Among them, the Solid-Oxide Electrolysis Cell (SOEC) stack stands out as the most promising in terms of efficiency but also the least mature at industrial level [2]. Large-scale application of the SOEC technology is driven by thriving in three main aspects: electro-chemical performance, mechanical performance, and manufacturability. The electro-chemical performance determines the conversion efficiency and the conversion rate, and it has been investigated for some years now. However, deployment at industrial scale requires a thorough evaluation of the mechanical performance of the SOEC stack technology, with a particular focus on the structural integrity of components and sub-structures and their operating lifetime. Given the fast-paced evolution desired for this technology, numerical simulations are essential to accelerate design and optimization processes and reduce the risk of unforeseen outcomes. The goal of this mini-symposium is thus to gather actors from industry and academia active in the analysis and simulation of mechanical performance of SOEC stacks, and to share current open problems, proposed solutions and future challenges.

REFERENCES

[1] A. Hauch et al., “Recent advances in solid oxide cell technology for electrolysis”, *Science*, Vol. **370** (2020).

[2] IEA, Electrolysers, IEA, Paris, 2022. https://www.iea.org/reports/electrolysers, License: CC BY 4.0.