Zinc-air battery for the stationary electricity storage

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Battery technologies applied to buffer the mismatch electricity production / demand have to comply with very tight economic constraints to be competitive with fossil fuel combustion technologies. Issues related to critical raw materials, manufacturing technologies and capacities are now at the forefront of the discussions and need to be addressed natively to any battery technology to be developed. The ZABSES project aims at demonstrating that a rechargeable alkaline zinc – air battery (ZAB) technology made of abundant materials, environmentally friendly, intrinsically safe can be a suitable solution. An integrated approach, joining experimental works and computational modelling, is adopted to develop cutting-edge materials, electrode architecture and electrode compositional characteristics for the construction of a rechargeable ZAB prototype. The French-German consortium gathers together the Cergy Paris University Laboratory of Physical Chemistry of Polymers and Interfaces (CYU-LPPI, France), the non-profit research institution Zentrum für Sonnenenergie und Wasserstoff-Forschung Baden-Württemberg (ZSW, Germany) at the interface between University and Industry, the R&D SME Sunergy (France), the Research Institute Deutsches Zentrum für Luft- und Raumfahrt / Helmholtz-Institut Ulm (DLR, Germany) and the company Varta Microbattery GmbH (Germany, as associated partner) for a concerted development of a rechargeable ZAB prototype embedding a bifunctional air cathode and having for objectives an energy density higher than 120 $Wh \cdot kg^{-1}$ and a stability of the performances up to 1000 load cycles.

In the present communications, an overview of the progresses towards the project objectives will be presented. Choices in terms of bifunctional air cathode architecture, and the associated manufacturing process, ZAB prototype design, Zn anode compositional characteristics, membrane-separator properties will be discussed within the frame of a rational development accounting for potential future upscaling. The derivation of a broadly applicable model for the transport through membrane-separator enables progresses towards a full computational modelling of the ZAB.

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