New polymer electrolytes for Li-O_2 batteries

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Li−O_2 batteries are a promising rechargeable battery alternative to Li-ion battery: combining the low density metallic lithium to the low-cost and environmentally friendly oxygen, they present a theoretical specific energy as high as 3582 Wh kg^{-1} [1]. However, this system presents nowadays safety issues and poor cycle stability, limiting their practical application. The use of metallic Li, indeed, leads to the formation of Li dendrites, 3D needles which can pierce the separator and short-circuit the cell, which can lead to thermal runaway reactions. Combined to the O_2 cross-over, moreover, dendrites result in capacity loss [2].
In this work we propose a solution to these drawbacks, a composite gel polymer electrolyte (C-GPE) consisting in a highly cross-linked polymer matrix, containing a dextrin based nanosponge. GPE, polymer matrices soaked with liquid electrolyte, have been successfully used in Li-O_2 battery. They have shown to protect lithium anode from the O_2 cross-over, as well as limiting electrolyte evaporation [3]**.** The integration of dextrin-based nanosponge (NS), hyper-crosslinked 3-D network of polymer, permits to enhance metallic Li stability even while increasing O_2 content at the cathode. This composite GPE, tested in a full cell with a simple commercial gas diffusion layer, demonstrates a full capacity of 5,05 mAh.cm^{-2} as well as an improved reversibility and longest cycle life compared to a liquid electrolyte-only Li-O_2 cell [4].

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