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Abstract

Anode-Less Rechargeable Lithium Battery: The Effect of an Artificial Interface Layer †

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Global warming is one of the most frightening threats to humanity, which is why decarbonization is critical to the future of the planet. In minimizing the adverse effects that humankind bestows to the planet, it is necessary to develop technologies capable of harvesting (e.g., solar and wind energy) and storing clean energy (e.g., capacitors, batteries, and fuel cells). Notice that storing energy is important because, frequently, harvesting sources are not able to make energy available whenever needed. Therefore, energy storage technology must also be sustainable. It is necessary to develop devices with higher energy density in order to support faster and economical charging with longer cycle lives to reduce the negative impacts of their production and, consequently, become more environmentally friendly.

Anode-less/free rechargeable batteries without excess lithium have inevitably drawn attention due to the absence of lithium in the manufacturing procedure, making them easy to assemble, more secure, and consequently less costly [1].

One of the big challenges of anode-less batteries is the cell's limited lithium source because not all of the initial lithium, plated on the collector upon the charge, is returned to the positive electrode during the discharge process. This large capacity loss is due to the successive formation of the solid electrolyte interface (SEI) layer with "dead" lithium and a high interfacial impedance [1,2].

Herein, we analyze anode-less cells based on a Li-rich ferroelectric solid-state electrolyte of the Li_3ClO family whose Li content is enough to prevent the cell's capacity loss. We also discuss new avenues to overcome the challenging task of plating the first layer of Li on the Cu current collector by using oxides as nucleation centers.

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