Impact of the Transition Metal Dopant in Zinc Oxide Lithium-Ion Anodes on the Solid Electrolyte Interphase Formation

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Abstract: Conversion/alloying materials (CAMs) provide substantially higher specific capacities than graphite, the state-of-the-art lithium-ion battery anode material. The ability to host much more lithium per unit weight and volume is, however, accompanied by significant volume changes, which challenges the realization of a stable solid electrolyte interphase (SEI). Herein, we report the comprehensive characterization of the composition and evolution of the SEI on transition metal (TM) doped zinc oxide as CAM model compound with a particular focus on the impact of the TM dopant (Fe or Co). The results unveil that the presence of iron specifically triggers the electrolyte decomposition. However, this detrimental effect can be avoided by stabilizing the interface with the electrolyte by a carbonaceous coating. These findings provide a great leap forward towards the enhanced understanding of such doped materials and (transition) metal oxide active materials in general.

Keywords: Solid electrolyte interphases, metal oxides, doping, anodes, lithium-ion batteries

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