Excellent Lithium Metal Anode Performance via In Situ Interfacial Layer Induced by $\text{Li}_{6.75}\text{La}_3\text{Zr}_{1.75}\text{Ta}_{0.25}\text{O}_{12}$ @Amorphous Li_3OCl Composite Solid Electrolyte

Yijun Tian ^{1,2}, Fei Ding ^{2,*}, Lin Sang ², Yan-Bing He ³, Xingjiang Liu ^{1,2}, Qiang Xu ^{1,**}

¹ School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072, P. R. China.

² National Key Laboratory of Science and Technology on Power Sources, Tianjin Institute of Power Sources, Tianjin 300384, P. R. China.

³ Engineering Laboratory for the Next Generation Power and Energy Storage Batteries, Graduate School at Shenzhen, Tsinghua University, Shenzhen, 518055, P. R. China.

*E-mail: fding@nklps.org, xuqiang@tju.edu.cn

doi: 10.20964/2019.05.67

Received: 20 April 2018 / Accepted: 17 May 2018 / Published: 10 April 2019

A LLZTO-2wt.% Li_3OCl composite solid electrolyte (LC) layer was attached to the surface of a Li metal electrode through a glass-fiber-paper (GF)-supported method to form a stable in situ reaction interfacial layer between the Li metal anode and an organic liquid electrolyte in Li metal batteries. The Li metal anode modified by GF-LC showed excellent cycling stability in a Li metal symmetric battery (over 1100 h stable cycles at 1 mA cm^{-2} / 1 mA h cm^{-2} with less corrosion of Li metal anode) and Li-Cu battery (over 300 h cycles at 1 mA cm^{-2} / 1 mA h cm^{-2} with Coulombic efficiency of 99.0%). The superior stability and dendrite-free mechanism of the GF-LC-modified Li metal anode is related to the reduced direct contact area and less corrosive side reactions between the organic electrolyte and the Li metal anode. Based on the excellent stability of the GF-LC-modified Li metal anode, a Li-S battery was assembled to research the effect of the GF-LC modified Li metal anode on cycling stability. Compared with Li-S batteries modified by pristine and GF-modified Li metal anodes, the GF-LC-modified Li-S battery showed better cycling stability and longer cycling life.

Keywords: Lithium Metal Anode; $\text{Li}_{6.75}\text{La}_3\text{Zr}_{1.75}\text{Ta}_{0.25}\text{O}_{12}$ @Amorphous Li_3OCl Composite Solid Electrolyte; Interfacial Layer; Li-S battery

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