

Abstract Submitted
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Performance of Silicon Carbonitride Functionalized MoS₂ Nanosheets as Lithium-ion Battery Anode¹ LAMUEL DAVID, ROMIL BHANDAVAT, URIEL BARRERA, GURPREET SINGH, Kansas State University — Liquid-phase exfoliated MoS₂ was functionalized with polysilazane polymer to yield ceramic SiCN-MoS₂ layered composite upon pyrolysis. Ceramization of polymer to ceramic phase on surfaces on MoS₂ was confirmed by electron microscopy and spectroscopic techniques. Electrochemical behavior of MoS₂ and SiCN-MoS₂ on both traditional and paper-based electrode architecture was investigated in a Lithium ion battery half-cell configuration. All electrodes showed the classical 3-phase behavior characteristic of a conversion reaction. SiCN-MoS₂ composite paper showed more stable cycling and higher reversible capacity retention than MoS₂. The contribution of conversion reaction in MoS₂ or electrolyte decomposition in overall capacity was found to reduce in SiCN-MoS₂ specimen, which is understood as one of the reason for decreased first cycle loss and increased capacity retention for SiCN-MoS₂ composite. In addition, the freestanding composite paper exhibited excellent C-rate performance, regaining approx. 97% of its initial charge capacity when the current density was reduced to 100 mA.g⁻¹ (508 mAh.g⁻¹) from 2400 mA.g⁻¹ (170 mAh.g⁻¹).

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