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Electrochemical Performances and Air Stability of Fe-doped CoS_2 Cathode Materials for Thermal Batteries

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In this work, Fe-doped CoS_2 ($Co_xFe_{1-x}S_2$) compounds were synthesized and evaluated as cathode materials for thermal batteries. The results verified bimetallic disulfides exhibited more balanced properties on the air stability and thermal stability compared to monometallic disulfides. Interestingly, a remarkable improvement in discharge performances could be achieved in bimetallic disulfide. The cells with bimetallic disulfides showed lower resistances and weakened polarization peak in comparison to that of CoS_2, which could contribute to the decrease in particle size and the variation in intermediate phase compositions during discharge, thus leading to better discharge performances. Moreover, S-$Co_{0.3}Fe_{0.7}S_2$ displayed significantly better discharge performances than other investigated stored-disulfides, which implied bimetallic disulfide could achieve superior electrochemical performances even being stored under air at high relative humidity. Therefore, the strategy of using bimetallic disulfides offers an attractive way to explore promising cathode materials for thermal batteries.

Keywords: Thermal batteries, $Co_xFe_{1-x}S_2$, Air stability, Electrochemical performance, Hydrothermal

FULL TEXT