In situ synthesis of 3DC-NiS$_2$-CNTs as a multi-functional host for Li-S batteries

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Lithium sulfur (Li-S) batteries are promising to be the next generation energy storage devices. Unfortunately, there are still many challenges for the practical application of Li-S batteries, such as the insulation of sulfur and the “shuttle effect” of lithium polysulfides (LiPSs). The introduction of carbon materials as a light, high electronic conductive host for sulfur and the inorganic compound as the polar host for the LiPSs has made some progress in solving these problems. Herein, for the first time, we present a new synthetic route to obtain the three-dimensional carbon-NiS$_2$-carbon nanotubes (3DC-NiS$_2$-CNTs) composites as the multi-functional host for Li-S batteries. The 3D and CNTs are connected by the NiS$_2$ nano particles, which serves as both effective entrapment and catalysis for LiPSs. The effective combination of graphene, CNTs and NiS$_2$ can not only inherit their individual advantages, but also herald a new multi-functional nanostructured material with unexpected properties. As a consequence, electrochemical performance of the Li-S batteries employing a 3DC-CNTs-NiS$_2$ host was enhanced significantly. The cell exhibits a high initial capacity 946 mAh g$^{-1}$ and stable cycling performance at 1 C with a fade rate of 0.093% per cycle over 300 cycles.

Recent Publications:


Biography

Ning Wang entered into Nanjing Tech University to study Metal Material Science and Engineering in 2008, and received his Bachelor degree in 2012. Then he continued to study Post graduation degree in Nanjing Tech University, engaged in research on lithium sulfur batteries. And he received his Master degree in 2015. After that, he entered Tianjin University to study PhD and his research direction is still lithium sulfur batteries.

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