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THE CONSTRUCTION OF NICL2@C/NI COMPOSITE FOR HIGH-POWER THERMAL BATTERY CATHODE MATERIAL

Abstract

The development of military equipment with high energy is crucial for modern military warfare. Meanwhile, thermal batteries with high specific energy, current discharge ability and reliability become the primary power sources for military weapons. Compared with traditional cathode material such as FeS2 and CoS2, NiCl2 is considered more promising for high power thermal batteries because of its high decomposition temperature, excellent theoretical specific capacity and large operating voltage. However, the poor structural stability and high polarization of NiCl2 have emerged as major challenges hindering its practical application. In this work, we demonstrate an engineering strategy to construct a high-performance NiCl2@C/Ni cathode material by modifying the surface of NiCl2 with carbon coating and incorporating nickel metal. Benefiting from accelerated reaction kinetics and improved structural stability resulting from the interaction among the robust porous carbon, the active material NiCl2 and the highly conductive metal Ni, the electrochemical activity of the prepared NiCl2@C/Ni cathode material is significantly enhanced. The NiCl2@C/Ni thermal battery demonstrates a high specific energy of 619 Wh kg-1 at a current density of 100 mA cm-2, which is more than twice that of pure NiCI2. This work can pave the way for the development of high-power thermal battery.