

Room-Temperature Na–CuCl₂ Secondary Battery by Using Incombustible Liquid Inorganic Electrolyte

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Na rechargeable batteries have gained much attention as alternative power sources to replace Li rechargeable batteries. Nevertheless, it is required Na rechargeable batteries to be further advanced to successfully penetrate rechargeable battery market because of their low energy density and poor reliability. Here, we demonstrate a new type of room temperature Na rechargeable battery that employs CuCl₂/C nanocomposite cathode material and SO₂-based inorganic liquid electrolyte. The cell delivered a high discharge capacity of 200 mAh g⁻¹, corresponding to theoretical energy density of 580 Wh kg⁻¹. It also showed a high round-trip energy efficiency (>96%) and excellent cycle-life over 1000 cycles, which has never been obtained in an organic electrolyte system. The remarkable electrochemical performance is mainly attributed to the use of the SO₂-based electrolyte, which guarantees a reversible conversion reaction between CuCl₂ and CuCl with NaCl. Further, detailed reaction mechanism of the new battery system will be discussed in this presentation.