Bi–Sn–Sb alloys as anode materials for magnesium ion batteries

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Abstract

In this work, the performance and electrochemical charge/discharge behavior of Sn–Bi–Sb ternary alloys were investigated, as well as pure Sn, Bi, and Sb powders, as anodes for magnesium ion batteries (MIBs). Alloying was utilized as an approach to modify the active phases in an effort to improve the specific capacity of elemental anodes of Bi and unlock the electrochemical activity of large size Sn and Sb particles towards magnesium. The magnesium storage mechanism of Bi0.5Sn0.25Sb0.25 alloys has also been explored.

Result

The high capacity indicates that Bi-Sn-Sb ternary alloy is a potential anode material for magnesium batteries. The maximum specific capacity of Bi-Sn-Sb ternary alloy can reach 587.1 mAh g−1.

The interaction of Bi, Sn and Sb greatly improved the reactivity of Sn and made Sb possess the ability of reversible reaction.

The electrochemical properties of Bi-Sn-Sb ternary alloy are greatly improved due to the increase of specific surface area of porous powders prepared by melting method.

Conclusion

- The high capacity indicates that Bi-Sn-Sb ternary alloy is a potential anode material for magnesium batteries. The maximum specific capacity of Bi-Sn-Sb ternary alloy can reach 587.1 mAh g⁻¹.
- The interaction of Bi, Sn and Sb greatly improved the reactivity of Sn and made Sb possess the ability of reversible reaction.
- The electrochemical properties of Bi-Sn-Sb ternary alloy are greatly improved due to the increase of specific surface area of porous powders prepared by melting method.