Supporting Information

Composition- and size-modulated porous bismuth-tin biphase alloys as anodes for advanced magnesium ion batteries

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Fig. S1. Schematic illustration of the formation of biphase P-Bi-Sn alloys through selective phase corrosion of rapidly solidified Al-Bi-Sn precursors. The triphase Al-Bi-Sn precursors with different Bi/Sn ratios were designed based upon positive mixing enthalpy between elements of Al, Bi and Sn.
Fig. S2. Al-Bi-Sn phase diagram at 606.6 °C.1 The compositions of Al-Bi-Sn alloys used in this work are highlighted by a blue line.
Fig. S3. Photograph showing the rapidly solidified Al-Bi-Sn alloy ribbons.
Fig. S4. XRD patterns of the rapidly solidified Al-Bi-Sn precursor alloys. For comparison, the XRD patterns of the rapidly solidified Al$_{95}$Bi$_5$ and Al$_{95}$Sn$_5$ are also shown, which are composed of Al/Bi and Al/Sn phases respectively.
Fig. S5. Photograph obtained after selective phase corrosion showing the final products which are in the form of powders.
Fig. S6. Photograph showing the Al$_{95}$Bi$_x$Sn$_y$ alloy ingot with a mass of more than 460 g. The present strategy could be easily scaled up.
Fig. S7. SEM image at low magnification of P-Bi$_3$Sn$_2$ alloy clearly showing the typical three-dimensional bi-continuous porous architecture.
Fig. S8. (a-e) Typical EDX spectrums of biphase P-Bi-Sn alloys. (f) Designed and actual compositions of P-Bi-Sn alloys.
Fig. S9. Ligament size distribution of P-Bi$_3$Sn$_2$ alloy measured from the TEM images.
Fig. S10. (a) A HAADF-STEM image of P-Bi$_3$Sn$_2$. The area for EDX mapping is highlighted by an orange box. (b) Simultaneous HAADF-STEM image and (c,d) corresponding EDX mapping spectrums.
Fig. S11. Discharge/charge profiles of P-Bi-Sn and P-Bi electrodes at the current density of 20 and 50 mA g⁻¹.
Fig. S12. Discharge/charge profiles of P-Bi-Sn and P-Bi electrodes in different cycles at the current density of 200 mA g\(^{-1}\).
Fig. S13. Discharge/charge profiles of P-Bi-Sn and P-Bi electrodes at different current densities from 50 to 1000 mA g\(^{-1}\).
Fig. S14. Discharge/charge profiles of P-Bi3Sn2 electrode in different cycles at the current density of 1000 mA g⁻¹.
References