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Owing to their disordered open network structure, oxide glasses are a promising class of anode materials for Lithium-Ion Batteries (LIBs). [1,2] However, the relatively low capacities of glass anodes severely limit their practical application for large energy storage devices. Here we show an unconventional novel approach, which significantly enhances the electrochemical performances of glass anodes for LIBs. Specifically, we incorporate water into an electrochemically active glass system, i.e., TeO_2-V_2O_5-P_2O_5 (TVP) glass powder via humidity treatment, and then mix the hydrated powder with additives to fabricate anode. The optimized humidity treatment leads to a significant enhancement of the reversible capacity in TVP glass anode, e.g., from 182 to 442 mA h g^{-1} at 1 A g^{-1} upon 200 cycles for TVP glass subjected to the 65% humidity treatment for 120 h at 333 K. This strategy also gives rise to the capacity retention of nearly 100% after 200 cycles at high current density. The incorporated -OH in TVP glass could result in broadening of the network channels for Li^+ diffusion and increasing active sites for lithium storage. [3] The hydration-induced nanocrystals feature specific surface area, thus providing more reaction sites. The optimum humidity for enhancing the anode performances was further verified by experimental results. This study brought a new, simple and economically effective approach for developing superior glass anodes for LIBs.

References

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