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VS_2 Nanoarchitectures Assembled by Single-crystal Nanosheets for Enhanced Sodium Storage Properties

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Abstract: Crystallinity structure plays a key role in the rate capability and cycling performance for rechargeable battery. However, the effect of crystallinity structure on sodium storage properties of VS_2 hasn't been clearly elucidated. In this work, VS_2 nanoarchitectures comprised of the nanosheets with single-crystal or polycrystalline structure are respectively synthesized by a facile solvothermal method, and the influence of crystallinity structure on their sodium storage properties is revealed. It is found that the single-crystal structure can largely enhance the Na^+ intercalation kinetics in the crystal lattice and the structure stability during charge/discharge process. Therefore, the single-crystal VS_2 electrode exhibits an enhanced rate capability and cycling performance, delivering a high capacity of 193 and 172 $mAhg^{-1}$ at a high rate of 0.5 and 1.0 Ag^{-1}, and 403 $mAhg^{-1}$ after the following cycling test of 200 cycles at 0.2 Ag^{-1}. This work opens up new insights for the exploration and design of high-performance electrode materials for sodium-ion batteries.

Keywords: VS_2; Crystallinity structure; Intercalation kinetics; Sodium-ion batteries; Anode;

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