NbO_x decorated on CNF for superior binder-free electrochemical performance

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The transition to renewable energy systems necessitates the development of high-capacity electrochemical storage devices. Conventional graphite anodes exhibit limited capacity, prompting the search for novel anode materials. Niobium (Nb)-based oxides have emerged as promising candidates due to their exceptional energy storage properties, attracting significant research interest [1], [2]. Among them, NbO demonstrates metallic conductivity, while NbO_2 and Nb_2O_5 exhibit semiconductor and insulating behaviours, respectively [3]. To enhance electrode performance, conductive carbon nanofibers (CNFs) were employed as a substrate, eliminating the need for binders in electrode fabrication. In this study, CNFs were uniformly coated with NbO_x using a facile hydrothermal method, and their electrochemical performance was systematically evaluated. This work highlights the potential of Nb-based oxides combined with conductive CNFs to overcome the limitations of traditional electrode materials, advancing the development of high-performance energy storage technologies.

References

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[2] L. Yan et al., “Ultrathin W9Nb8O47 nanofibers modified with thermal NH3 for superior electrochemical energy storage,” Energy Storage Mater., vol. 14, pp. 159–168, Sep. 2018, doi: 10.1016/j.ensm.2018.03.005.

[3] X. Zhang et al., “Review on niobium-based chalcogenides for electrochemical energy storage devices: Application and progress,” Nano Energy, vol. 65, p. 104049, Nov. 2019, doi: 10.1016/j.nanoen.2019.104049.

Figures

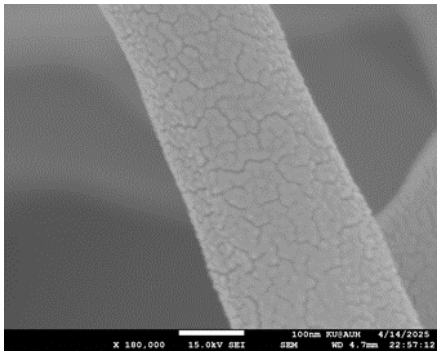

Figure 1: SEM image of pristine CNF

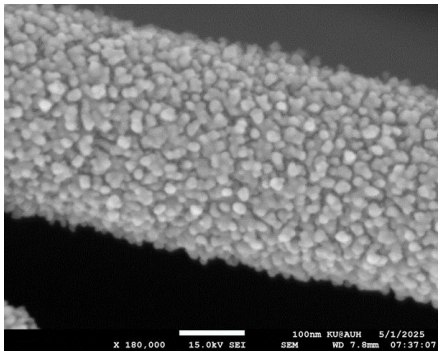

Figure 2: SEM image of NbO_x deposition on CNF substrate