# Facile synthesis of platelet-like zirconium tungstate nanostructures for high-performance supercapacitors

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**Summary**

Increasing demand for electronic devices has sparked quantum of research work on energy storage systems. In the present work, we report the facile synthesis of platelet-like Zirconium tungstate ($ZrW_2O_8$ NPs) binary metal oxide via co-precipitation method. The $ZrW_2O_8$ NPs was confirmed by several physicochemical techniques. Furthermore, FESEM images proved the platelet-like morphology of $ZrW_2O_8$ NPs. The as-prepared $ZrW_2O_8$ NPs was used as electrode material in the fabrication of supercapacitors. $ZrW_2O_8$ NPs @ Ni foil shows the specific capacitance ($C_{sp}$) maximum of 508 $F\,g^{-1}$ at 5 mV/s and showed 91.3% of cyclic stability after 4000 GCD cycles. As a result, $ZrW_2O_8$ NPs was utilized as an anode electrode material to construct an asymmetric device, $ZrW_2O_8$ NPs || Activated carbon (AC). The as-fabricated device showed the energy density of 9.65 $Wh\,kg^{-1}$ related to the power density of 299.48 $W\,kg^{-1}$. The effective supercapacitive behavior might be due to the unique morphological features, occurrence of multiple redox sites, and enhanced electrical conductivity of $ZrW_2O_8$ NPs. Thus, all these findings account for the applicability of $ZrW_2O_8$ NPs as electrode material in high-performance supercapacitors.

**KEYWORDS**

nanoplatelets, specific capacitance, supercapacitors, $ZrW_2O_8$ NPs, $ZrW_2O_8$ NPs || AC device

## 1 | INTRODUCTION

The rapid development of population density creates the energy crises globally. According to the Energy Information Administration (EIA), fossil fuels including petroleum, coal, natural gas, etc. are the major sources for energy production.[1] Owing to continuous depletion of fossil fuels, many researchers focused on developing alternate sources for the energy production. Electrochemical energy storage (EES) systems and the development of its materials are the emerging fields to address the difficulties of long-term energy supply. Moreover, electrochemical reactions based technological innovations are being used to develop efficient batteries and supercapacitors with extended power capacity and long cycle life against the common ground.[2-5]

Among the electrochemical based energy storage and conversion systems, supercapacitors are known to be efficient, owing to their improved energy and power density, extended cycle life etc.[6,7] In addition, SCs proved their superior efficiency in portable/flexible electronic devices than the batteries.[2,6,8,9] On the basis of storage

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