

# Synergistic Integration of 2D V<sub>2</sub>C With Zn-MOFs For Improved Energy Storage Supercapacitor Application

Irum Shaheen<sup>a</sup>, Iftikhar Husain<sup>b</sup>, Isaac Abrahams<sup>a</sup>

<sup>a</sup>Queen Mary University of London, the Mile End, London UK.

<sup>b</sup>Department of Mechanical Engineering, City University of Hong Kong, 83 Tat Chee Avenue, Kowloon, Hong Kong

## ABSTRACT

### Introduction:

MXenes are emerging as highly attractive two-dimensional materials in the field of energy challenges such as poor dispersion of MXene in the organic solvent. Herein, we have reported the integration of MXene with MOFs for improved energy storage supercapacitor.

### Methodology:

We have employed tuned microenvironment method (TMM)<sup>1</sup> to synthesize Zn-MOF integrated V<sub>2</sub>C complex by tuning the microenvironment of MXene for improving the dispersion of MXene in the organic medium. Zn-MOF integrated V<sub>2</sub>C complex is then employed in fabrication of supercapacitor electrode for energy storage.

### Results:

The TMM is an efficient approach for quick dispersion of V<sub>2</sub>C MXene in organic solvents by simple stirring and shaking.<sup>1</sup> The synthesized Zn-MOF integrated V<sub>2</sub>C dispersed in an organic solvent demonstrates exceptional oxidation resistance at room temperature. The electrochemical properties of Zn-MOF integrated V<sub>2</sub>C are investigated in 3M aqueous KOH electrolyte by cyclic voltammetry (CV) and galvanostatic charge discharge (GCD) at range of scanning rates and current densities respectively.<sup>2-3</sup> The significant specific capacitance and excellent rate capability are well exhibited by CV and GCD measurement. Furthermore, GCD measurements reveal remarkable cyclic stability of Zn-MOF integrated V<sub>2</sub>C. The electrochemical conductivity and internal resistance are studied by electrochemical impedance spectroscopy illustrating lower resistance and higher ionic as well as electronic conductivity.

### Conclusion:

Consequently, overall results of this work reveal that the integration of MXene with MOFs is a promising potential approach for developing MXene based novel electrode with significantly improved stability and higher charge storage for practical application of supercapacitor.

**Keywords:** Vanadium carbide; MAX Phase; Mxenes; Organic complex; Charge Storage.

### References:

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