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Probing the electrochemistry of MXene (Ti_2CT_x)/electrolytic manganese dioxide (EMD) composites as anode materials for lithium-ion batteries

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ABSTRACT:

The performance of MXenes (Ti_2CT_x) combined with electrolytic manganese dioxide (EMD) in three different weight ratios (i.e. MXene:EMD = 20:80; 50:50; 80:20) were examined as anode material for Lithium-ion batteries (LIBs). A study of the structure, composition and morphology of the synthesized materials was conducted. The materials were further investigated for their electrochemical properties in a half-cell configuration using impedance spectroscopy measurements, cyclic voltammetry and galvanostatic charge-discharge cycling. Results showed that the combined MXene/EMD material has a greater cycling stability, capacity and rate capability as compared to the EMD. The best ratio was found to be MXene:EMD = 80:20. The capacity obtained for this material after 200 cycles is 460 mA h g^{-1} at a current density of 100 mA g^{-1}. The Li-ion accessibility improved with cycling. This study provides a first insight into the viability of using one of the lightest known MXenes and EMD composite for improved LIB anodes. As EMD is a low cost and abundant material, it provides great opportunities for improved capabilities for lightweight applications at an affordable cost.