# Supporting Information

# Constructing P-doped self-assembled $V_2C$ MXene/NiCo-layered double hydroxide hybrids toward advanced lithium storage

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**Supplementary Figures**

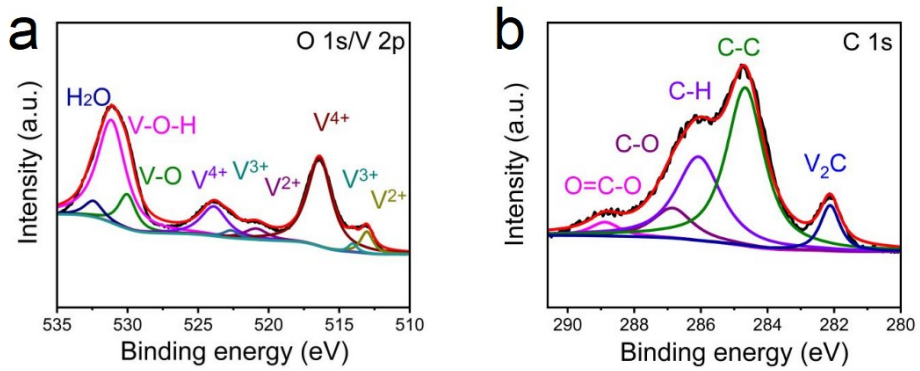


**Figure S1** High-resolution XPS spectra of (a) O 1s/V 2p and (b) C 1s in the $V_2C$.

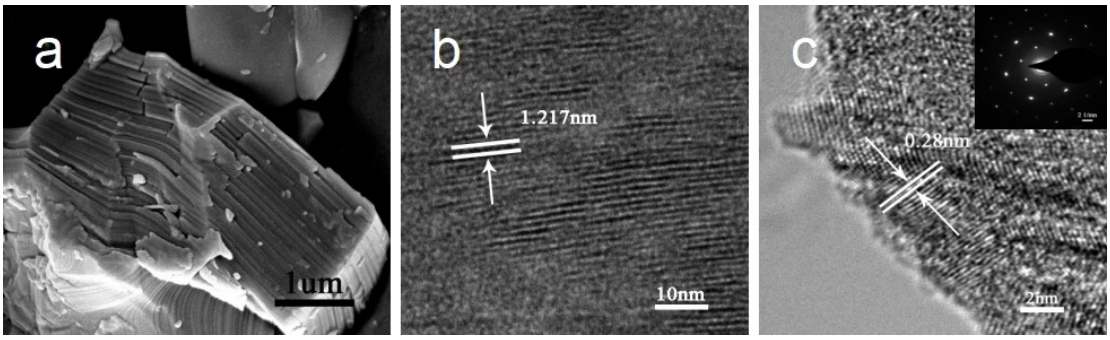


**Figure S2** (a) SEM image of $VAl_2C$ MAX; (b) TEM and (c) HRTEM images of $V_2C$ MXene, the inset corresponds to the SAED pattern of $V_2C$.

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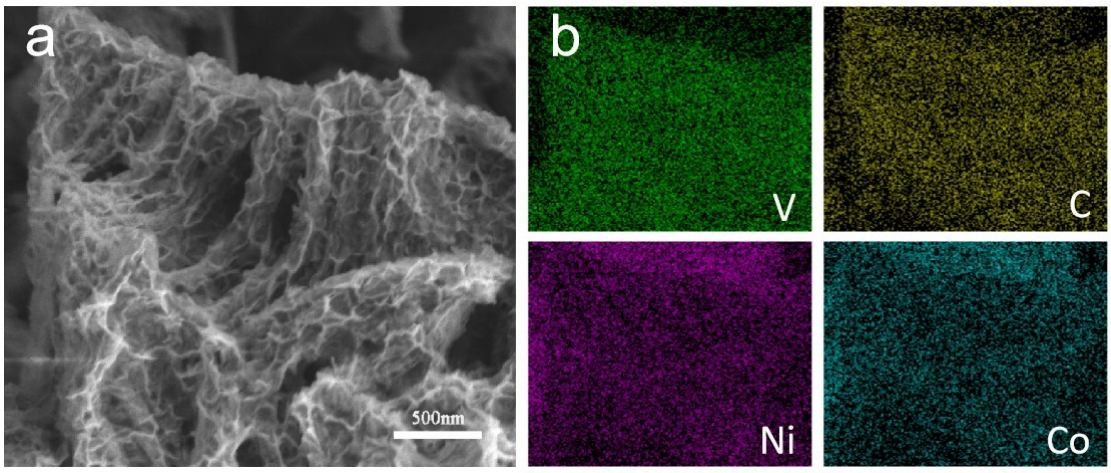


**Figure S3** (a) SEM image of $V_2C$/NiCo-LDH hybrids; (b) EDS results of $V_2C$/NiCo-LDH hybrids.

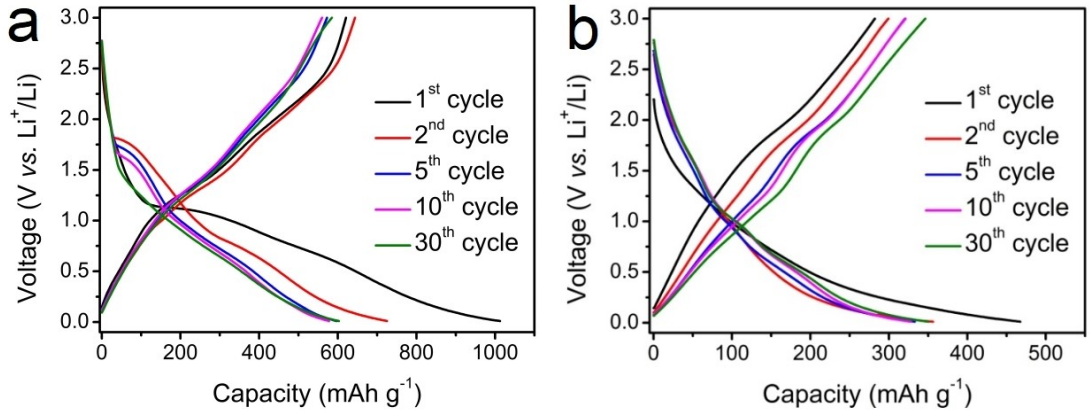


**Figure S4** Selected galvanostatic charge-discharge profiles of the (a)$V_2C$/NiCo-LDH and (b) $V_2C$ electrodes.

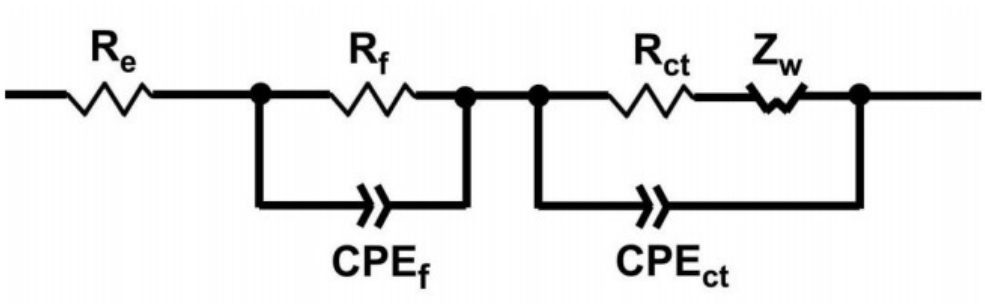


**Figure S5** Equivalent circuit model for Nyquist plots in Figure 4e.

The equivalent circuit model (Figure S5 includes ohmic resistance of the electrolyte and cell components ($R_e$), SEI layer resistance ($R_f$), charge-transfer resistance ($R_{ct}$), Warburg diffusion impedance ($Z_w$), dielectric relaxation capacitance ($CPE_f$) and double layer capacitance ($CPE_{ct}$).

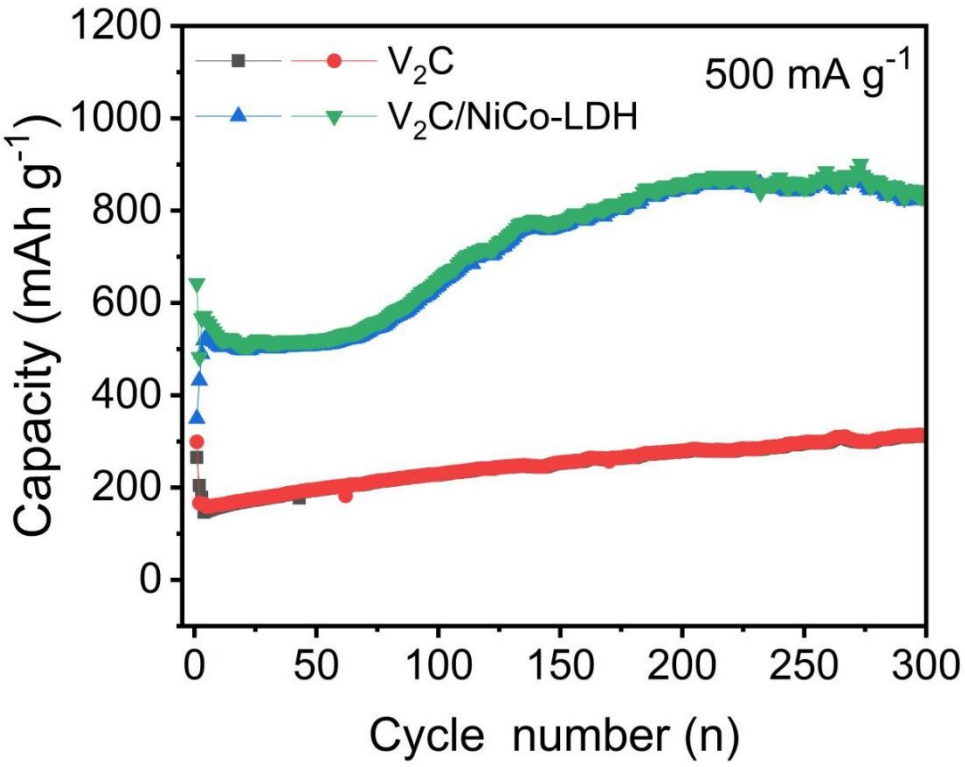


**Figure S6** Cycling behaviors of $V_2C$ and $V_2C$/NiCo-LDH electrodes at 500 mA $g^{-1}$.

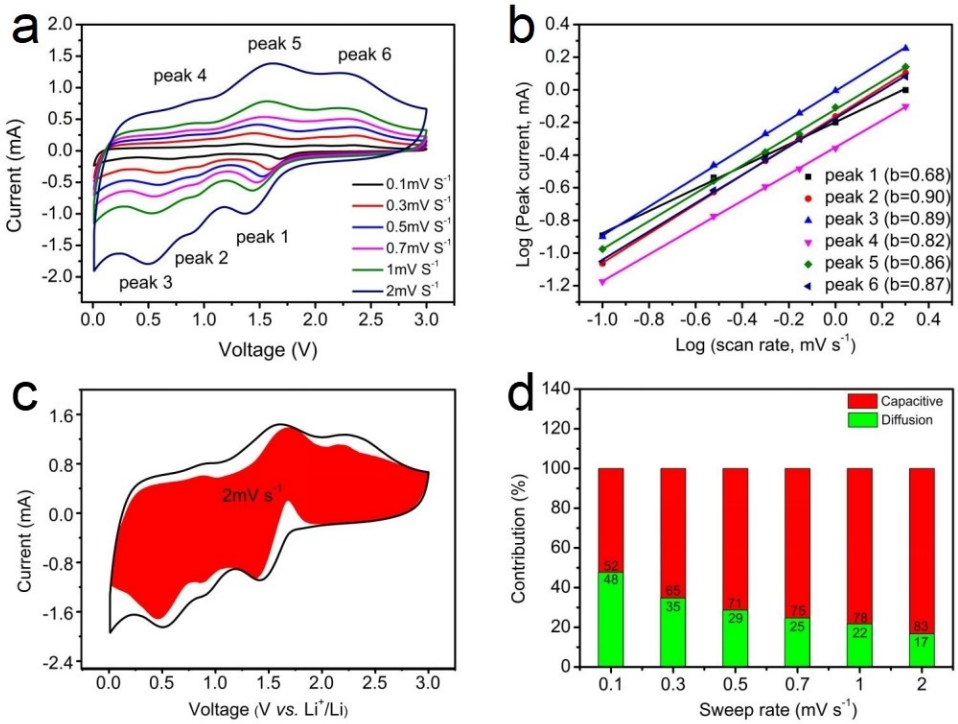


**Figure S7** (a) CV curves of the $V_2C$/NiCo-LDH electrode at different scan rates as indicated; (b) Relationship between peak current and scan rate at different scan rates; (c) CV profile at 2 mV $s^{-1}$ with the capacitive contribution (red region); (d) Normalized contribution ratios of the capacitive (red) and diffusion-dominated (green) capacities at various sweep rates based on quantitative analysis.