

Supplementary materials

The conductivity and thickness of the MXene films and SA composites are adapted from Ref. [1], and listed in the following figures.

Table S1. Physical parameters for Fig. 2(a) and Fig. 4(a) in main text.

MXene films	Conductivity σ (S/m)	Thickness h (um)
$\text{Mo}_2\text{TiC}_2\text{T}_x$	11970	2.5
$\text{Mo}_2\text{Ti}_2\text{C}_3\text{T}_x$	29790	2.5
$\text{Ti}_3\text{C}_2\text{T}_x$	466510	2.5

Table S2. Physical parameters for Fig. 2(c) and Fig. 4(b) in main text.

MXene films	Conductivity σ (S/m)	Thickness h (um)
$\text{Ti}_3\text{C}_2\text{T}_x$	466510	1.5
		2.5
		6
		11.2
		21.5
		45

Table S3. Physical parameters for Fig. 3(a) in main text.

Ti3C2Tx-SA composites	Conductivity σ (S/m)	Thickness h (um)
$\text{Ti}_3\text{C}_2\text{T}_x\text{-SA}$ (10wt. %)	50	8
$\text{Ti}_3\text{C}_2\text{T}_x\text{-SA}$ (30wt. %)	13400	
$\text{Ti}_3\text{C}_2\text{T}_x\text{-SA}$ (50wt. %)	62400	
$\text{Ti}_3\text{C}_2\text{T}_x\text{-SA}$ (60wt. %)	117700	
$\text{Ti}_3\text{C}_2\text{T}_x\text{-SA}$ (80wt. %)	184100	
$\text{Ti}_3\text{C}_2\text{T}_x\text{-SA}$ (90wt. %)	296300	