

Supporting Information

Engineering Ti_3C_2 electronic structure via surface termination synergy for high-efficiency electromagnetic wave absorption

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Supplementary Information contains:

1. Supplementary Fig. S1–S12
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3. Supplementary References

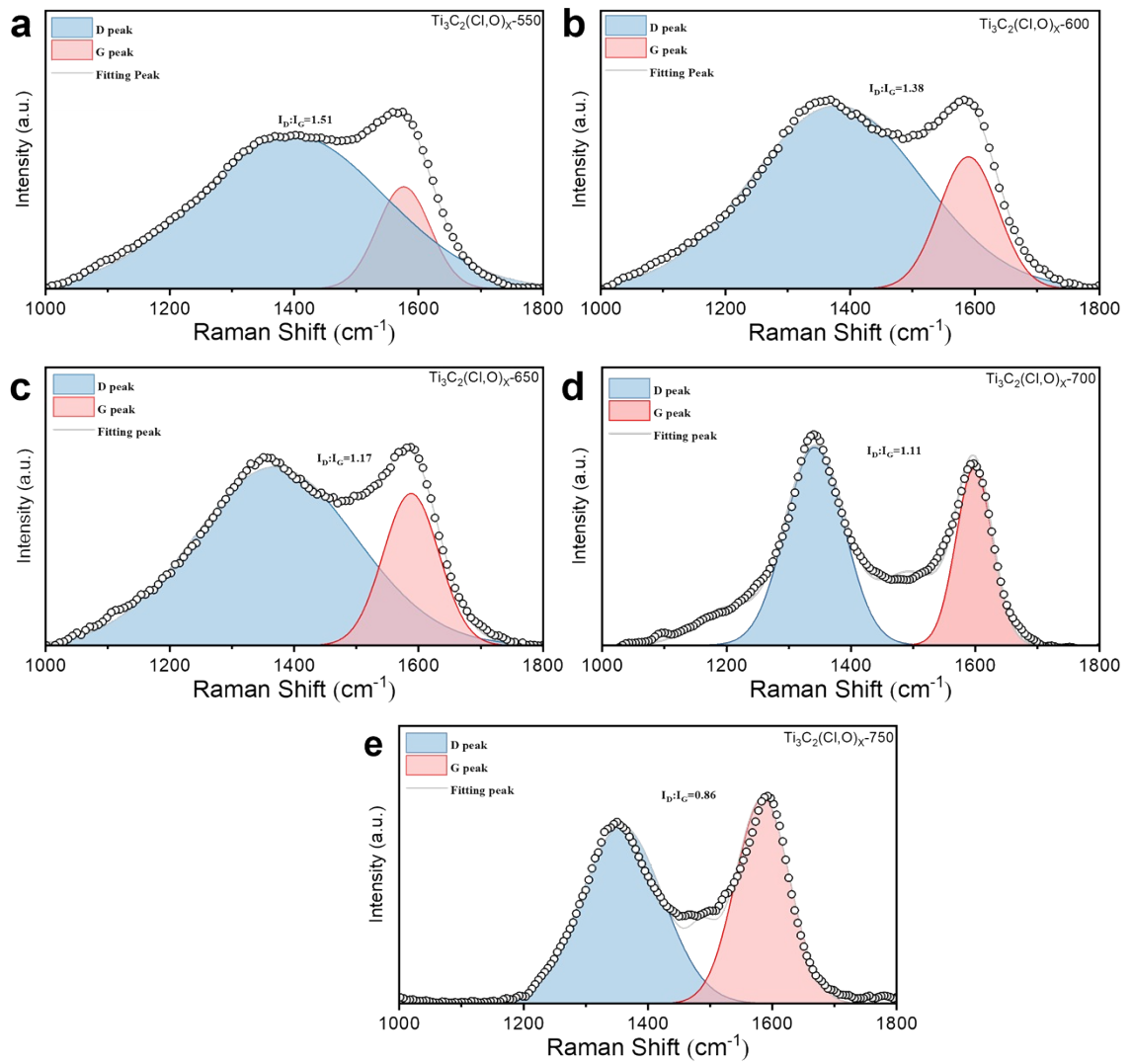


Fig. S1 Raman spectras of (a) Ti₃C₂(Cl,O)_{x-550}, (b) Ti₃C₂(Cl,O)_{x-600}, (c) Ti₃C₂(Cl,O)_{x-650}, (d) Ti₃C₂(Cl,O)_{x-700}, (e) Ti₃C₂(Cl,O)_{x-750}.

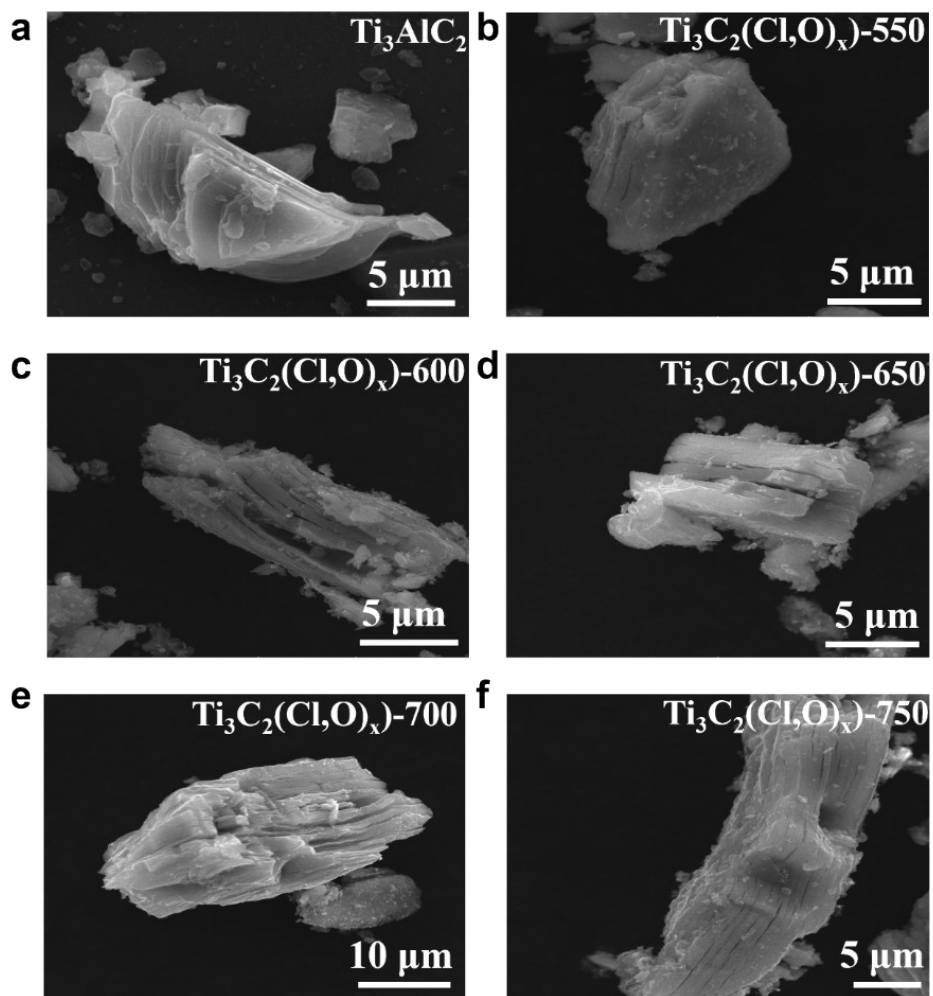


Fig. S2 SEM images of (a) Ti_3AlC_2 , (b) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-550$, (c) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-600$, (d) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-650$, (e) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-700$, (f) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-750$.

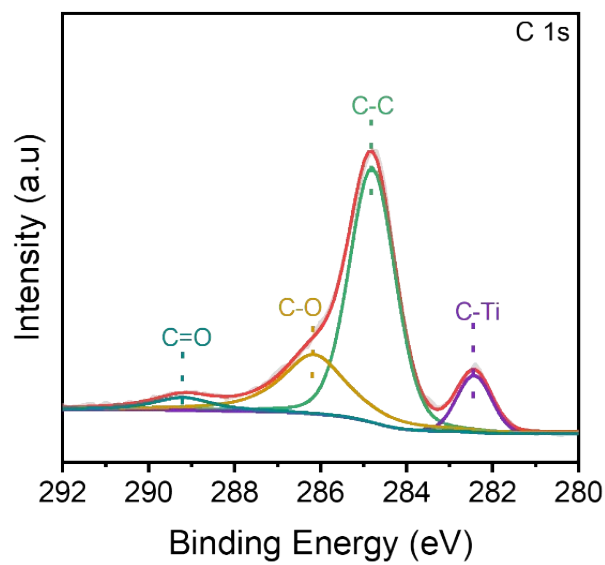


Fig. S3 C 1s spectrum of $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-650$.

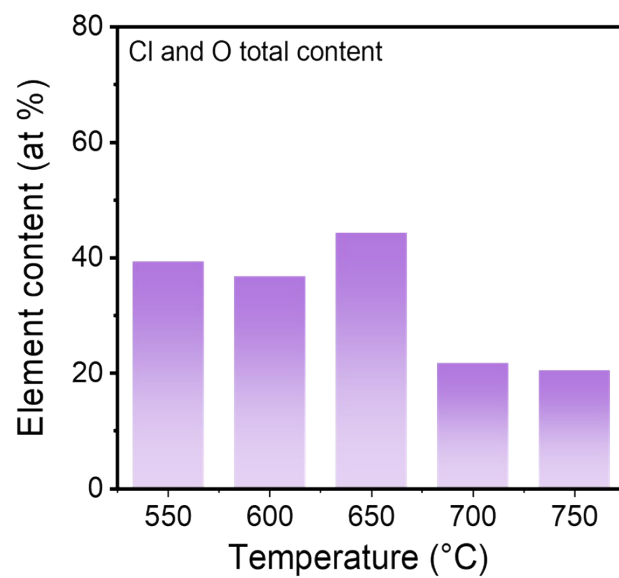


Fig. S4 The total number of Cl and O atoms in $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-T$ samples.

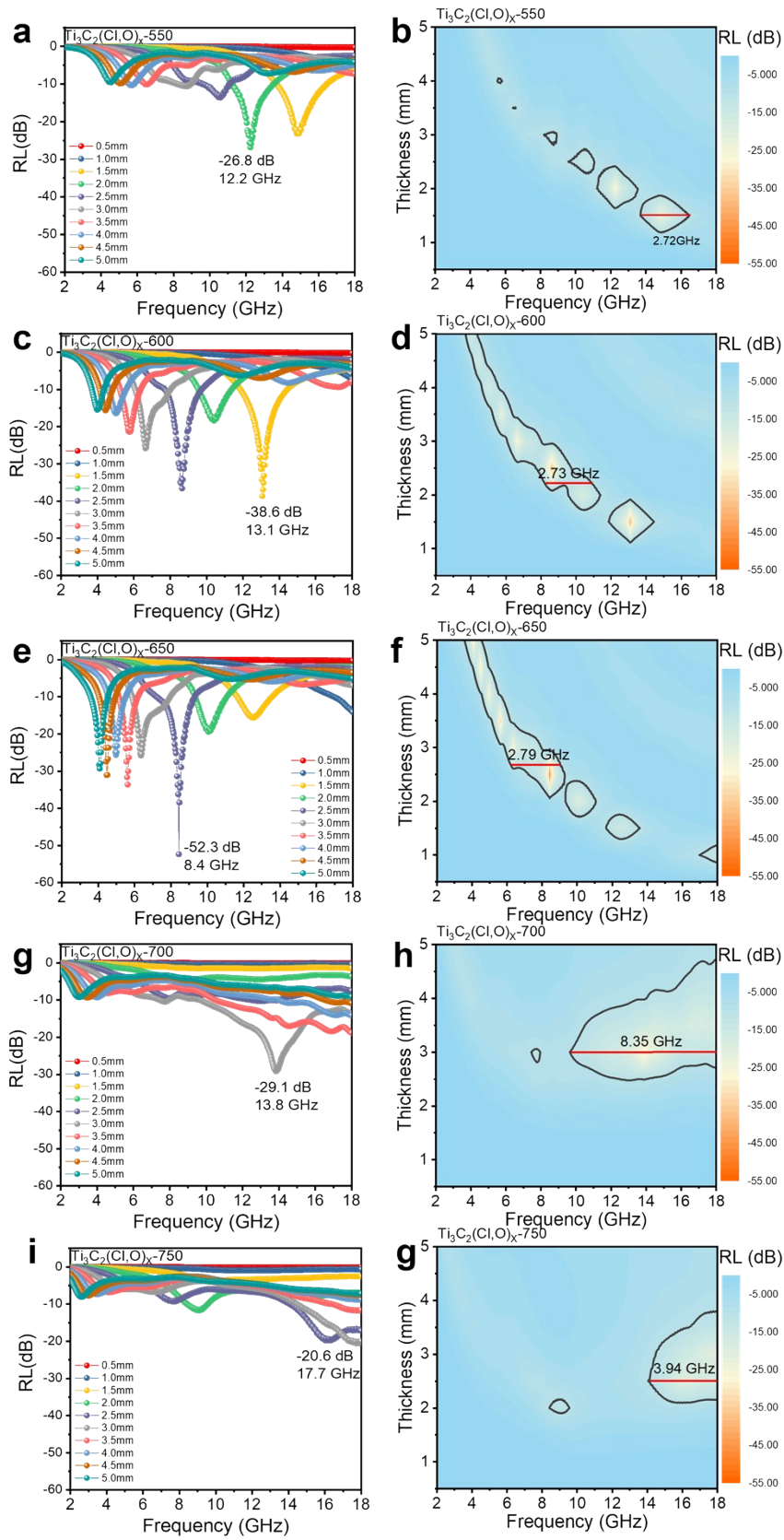


Fig. S5 RL curves and 2D contour plots of RL for (a,b) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-550}$, (c,d) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-600}$, (e,f) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-650}$, (g,h) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-700}$, (i,g) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-750}$.

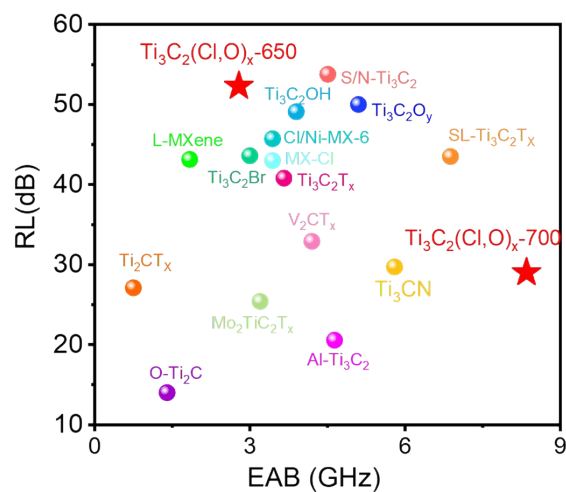


Fig. S6 Comparison of EMW absorption performances.

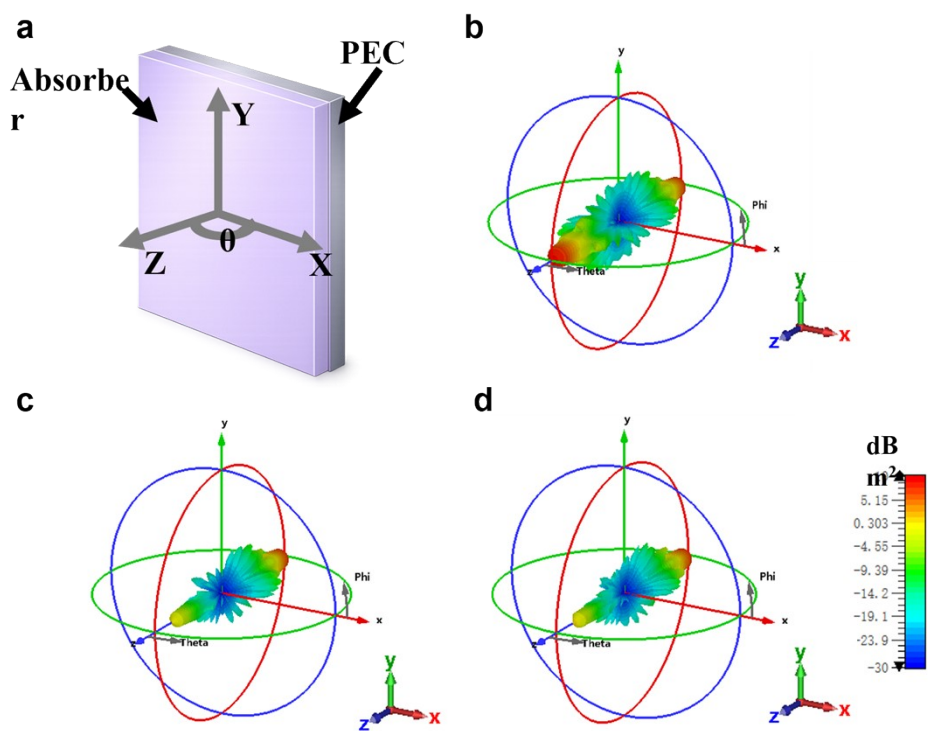


Fig. S7 (a) RCS simulation model, 3D RCS of (b) PEC, (c) PEC coated with $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-650$ at 2.5 mm, (d) PEC coated with $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-700$ at 3.0 mm.

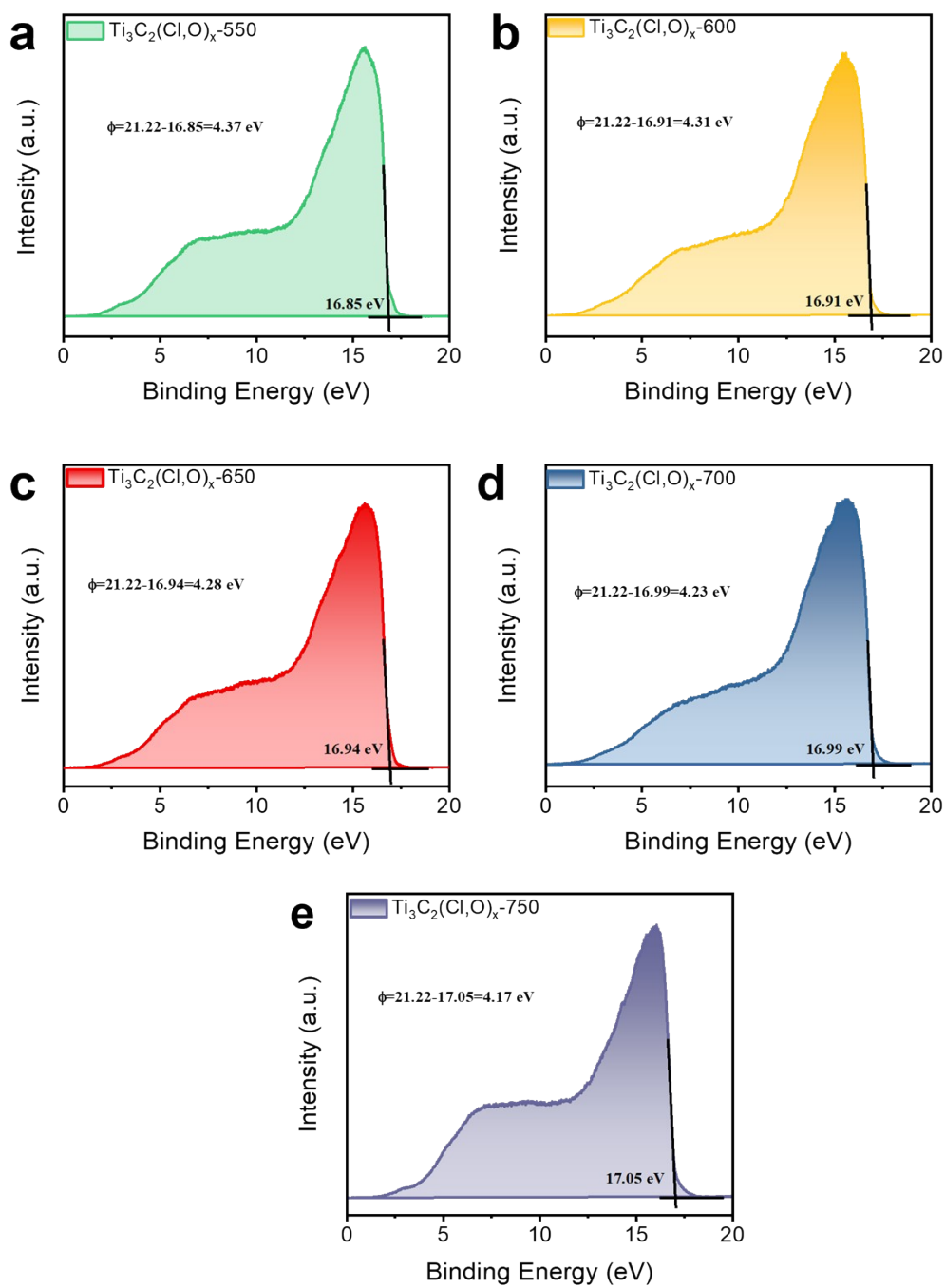


Fig. S8 Work functions of (a) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-550}$, (b) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-600}$, (c) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-650}$, (d) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-700}$, (e) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_{x-750}$.

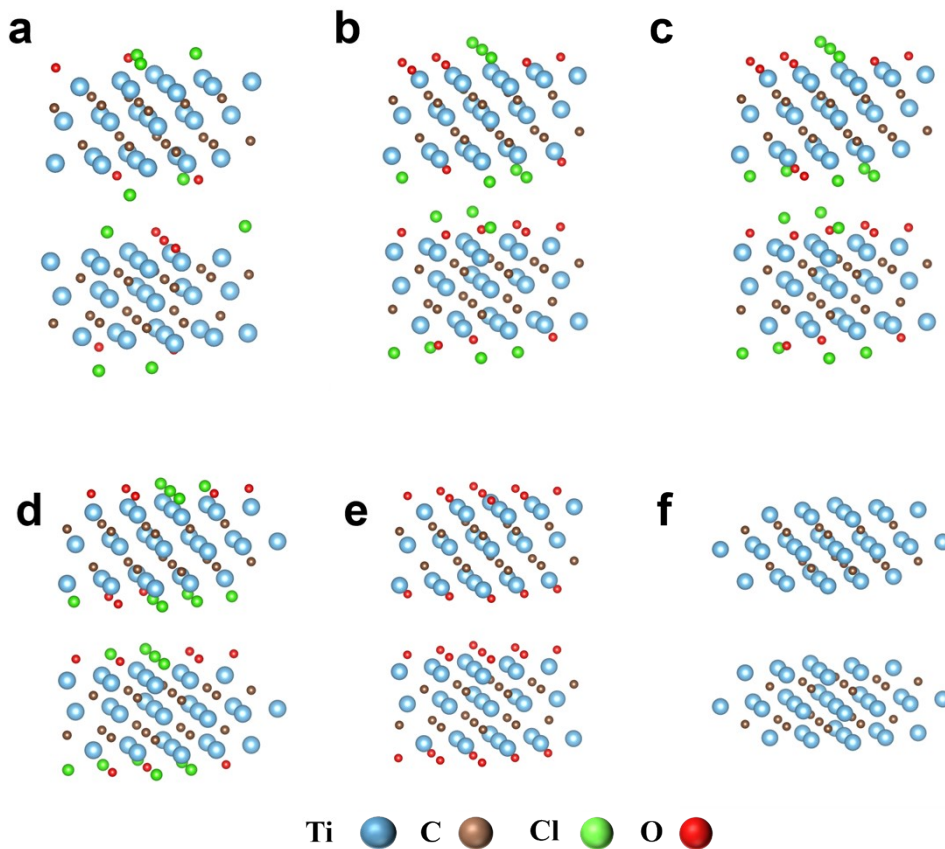


Fig. S9 Theoretical computational models. (a) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x$ with a surface Cl/O atomic ratio of 0.5, (b) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x$ with a surface Cl/O atomic ratio of 0.6, (c) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x$ with a surface Cl/O atomic ratio of 0.7, (d) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x$ with a surface Cl/O atomic ratio of 1.3, (e) Ti_3C_2 with O functional groups, (f) Ti_3C_2 without functional group.

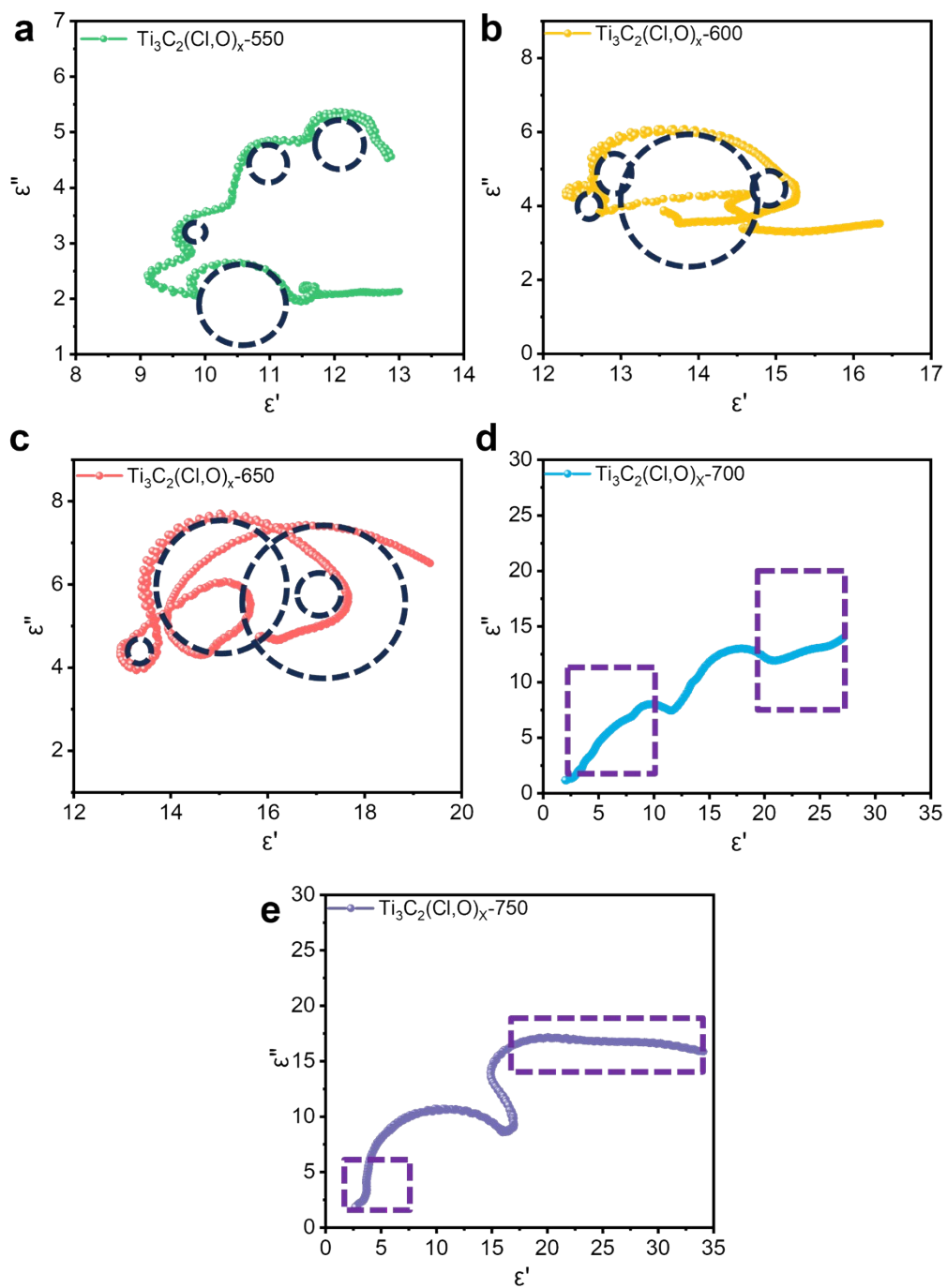


Fig. S10 Cole-Cole curves of (a) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-550$, (b) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-600$, (c) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-650$, (d) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-700$, (e) $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x-750$.

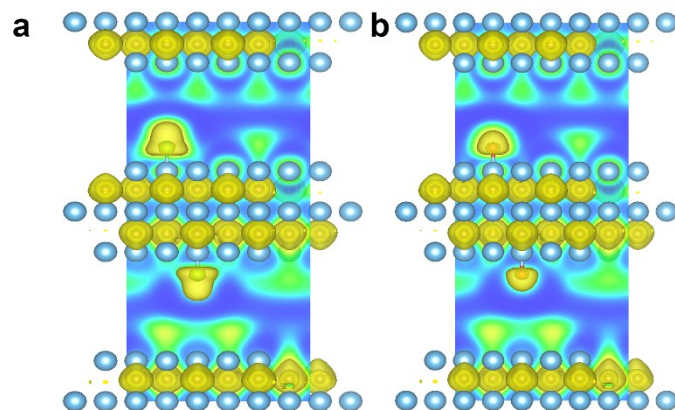


Fig. S11 2D ELF plots of Ti-Cl and Ti-O chemical bonds in the $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x$ model.

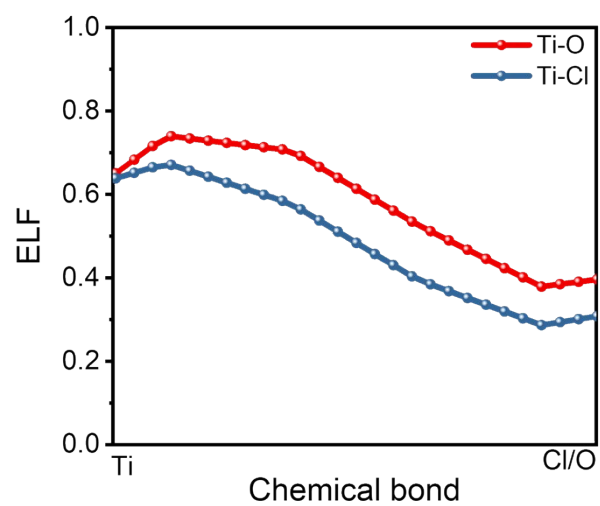


Fig. S12 Line profiles of Ti-Cl and Ti-O bonds of ELF value in $\text{Ti}_3\text{C}_2(\text{Cl},\text{O})_x$.

Table S1 Performance comparison of different MXenes

<i>Samples</i>	<i>RL_{min} (dB)</i>	<i>EAB_{max} (GHz)</i>	<i>Reference</i>
<i>Ti₃C₂T_x</i>	-40.80	3.66	1
<i>Ti₂CT_x</i>	-27.10	0.75	2
<i>MX-Cl</i>	-42.99	3.44	3
<i>Cl/Ni-MX-6</i>	-45.72	3.44	4
<i>Ti₃C₂O_y</i>	-50.50	5.10	5
<i>V₂CT_x</i>	-32.90	4.20	6
<i>L-MXene</i>	-43.14	1.84	7
<i>SL-Ti₃C₂T_x</i>	-43.50	6.88	8
<i>Al-Ti₃C₂</i>	-20.56	4.64	9
<i>Ti₃CN</i>	-29.70	5.80	9
<i>Ti₃C₂Br</i>	-43.60	3.00	9
<i>Ti₃C₂OH</i>	-49.10	3.90	10
<i>Mo₂TiC₂T_x</i>	-25.39	3.20	11
<i>O-Ti₂C</i>	-14.00	1.44	12
<i>S/N-Ti₃C₂</i>	-53.77	4.51	13
<i>Ti₃C₂(Cl,O)_x-650</i>	-52.30	2.79	This work
<i>Ti₃C₂(Cl,O)_x-700</i>	-29.00	8.35	This work

Supplementary references

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