Supporting Information

Formation of Hydrocarbons and Carbon Oxides in MXene Reactions with Water under Varying Oxidative Conditions

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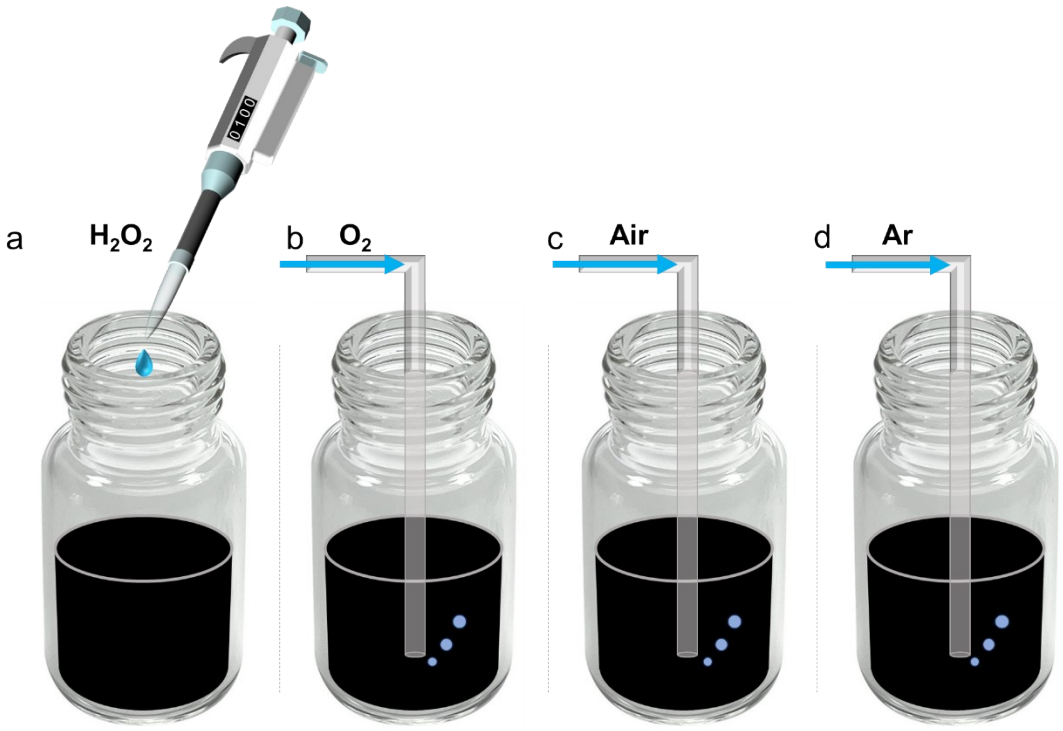

Figure S1. Preparation for MXene degradation samples under (a) H_2O_2, (b) O_2, (c) air, and (d) Ar. The samples were sealed immediately after purging.

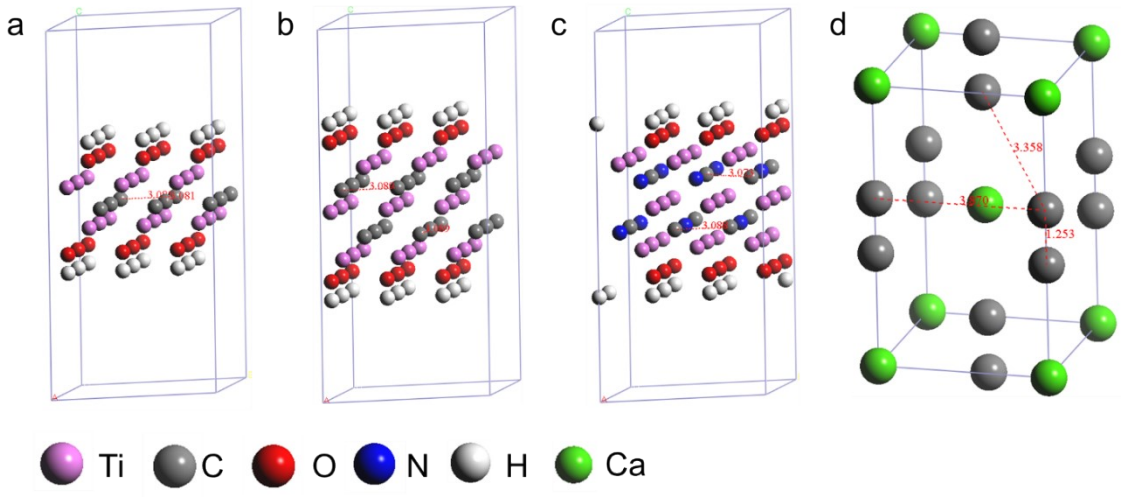

Figure S2. DFT optimized atomistic models of monolayer (a) $Ti_2C(OH)_2$, (b) $Ti_3C_2(OH)_2$, (c) $Ti_3CN(OH)_2$, and (d) CaC_2.

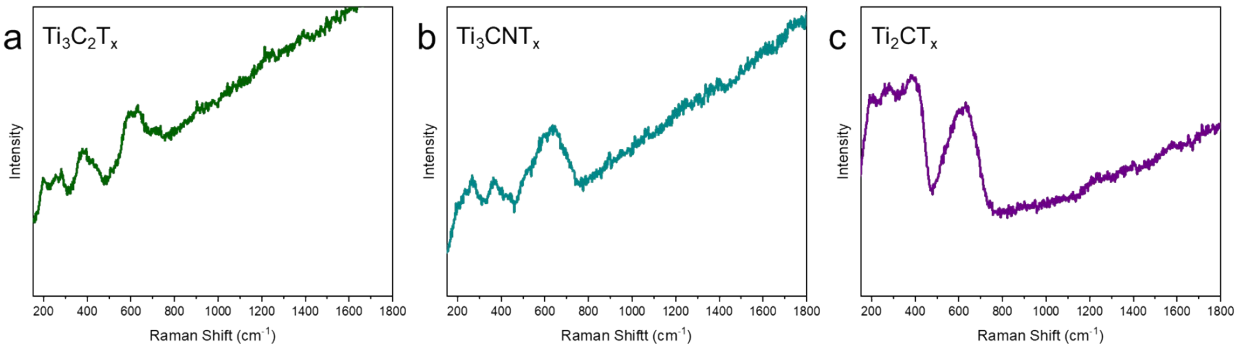

Figure S3. Raman spectra of (a) $Ti_3C_2T_x$, (b) Ti_3CNT_x, and (c) Ti_2CT_x MXenes recorded in an extended range of frequencies to show region of carbon Raman peaks.

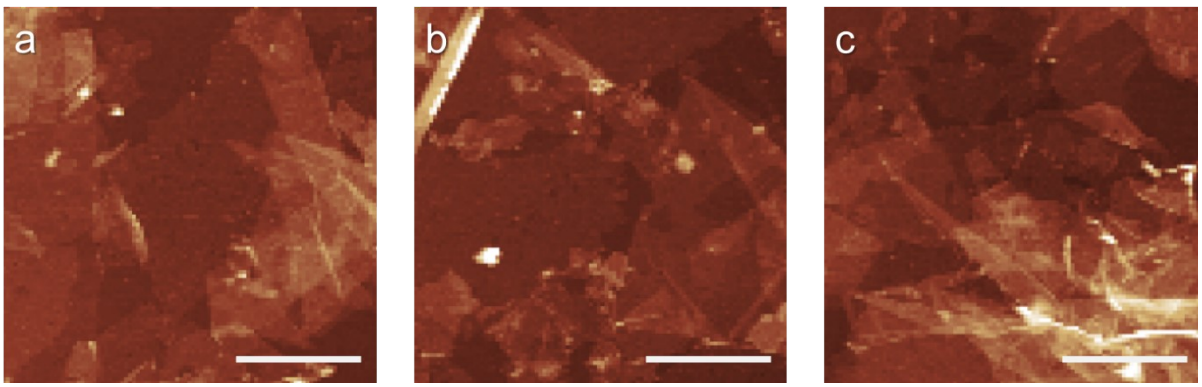

Figure S4. AFM images of (a) $Ti_3C_2T_x$, (b) Ti_3CNT_x, and (c) Ti_2CT_x MXenes. Scale bars are 1 µm.

Table S1. Gas composition produced from MXenes under various environmental conditions.

Ti_2CT_x	Gas	mol. %	SD	Ti_3CNT_x	Gas	mol. %	SD	$Ti_3C_2T_x$	Gas	mol. %	SD
H_2O_2	CH_4	75.72	2.72	H_2O_2	CH_4	33.38	2.41	H_2O_2	CH_4	54.33	11.41
	C_2H_2	1.92	0.14		C_2H_2	0.90	0.13		C_2H_2	0.17	0.03
	C_2H_4	2.73	0.09		C_2H_4	1.13	0.10		C_2H_4	1.84	0.21
	C_2H_6	0.76	0.04		C_2H_6	0.11	0.02		C_2H_6	0.20	0.05
	CO	13.26	2.72		CO	41.87	4.77		CO	31.32	7.58
	CO_2	5.61	0.87		CO_2	22.61	6.24		CO_2	12.14	4.31
O_2	CH_4	97.86	0.22	O_2	CH_4	90.84	0.54	O_2	CH_4	88.51	1.29
	C_2H_2	0.00	0.00		C_2H_2	0.24	0.03		C_2H_2	0.12	0.03
	C_2H_4	0.10	0.05		C_2H_4	2.64	0.16		C_2H_4	3.48	0.21
	C_2H_6	0.48	0.05		C_2H_6	0.49	0.01		C_2H_6	0.34	0.02
	CO	0.00	0.00		CO	3.49	0.87		CO	5.60	0.96
	CO_2	1.56	0.20		CO_2	2.30	0.21		CO_2	1.95	0.14
Air	CH_4	98.94	0.14	Air	CH_4	95.32	0.45	Air	CH_4	91.09	0.83
	C_2H_2	0.00	0.00		C_2H_2	0.11	0.01		C_2H_2	0.15	0.01
	C_2H_4	0.03	0.00		C_2H_4	1.87	0.19		C_2H_4	3.93	0.26
	C_2H_6	0.29	0.02		C_2H_6	0.55	0.03		C_2H_6	0.37	0.01
	CO	0.00	0.00		CO	1.15	0.47		CO	3.48	0.66
	CO_2	0.74	0.13		CO_2	1.00	0.11		CO_2	0.98	0.04
Ar	CH_4	99.48	0.11	Ar	CH_4	96.75	0.36	Ar	CH_4	93.44	1.27
	C_2H_2	0.00	0.00		C_2H_2	0.20	0.04		C_2H_2	0.19	0.05
	C_2H_4	0.03	0.01		C_2H_4	1.58	0.22		C_2H_4	3.84	0.71
	C_2H_6	0.15	0.03		C_2H_6	0.39	0.06		C_2H_6	0.39	0.04
	CO	0.00	0.00		CO	0.00	0.00		CO	0.82	0.82
	CO_2	0.34	0.12		CO_2	1.08	0.14		CO_2	1.32	0.48