

In situ Constructing Ti_3C_2 MXene/ TiO_2 heterojunctions with efficient piezoelectric catalytic activity for high antibacterial performance

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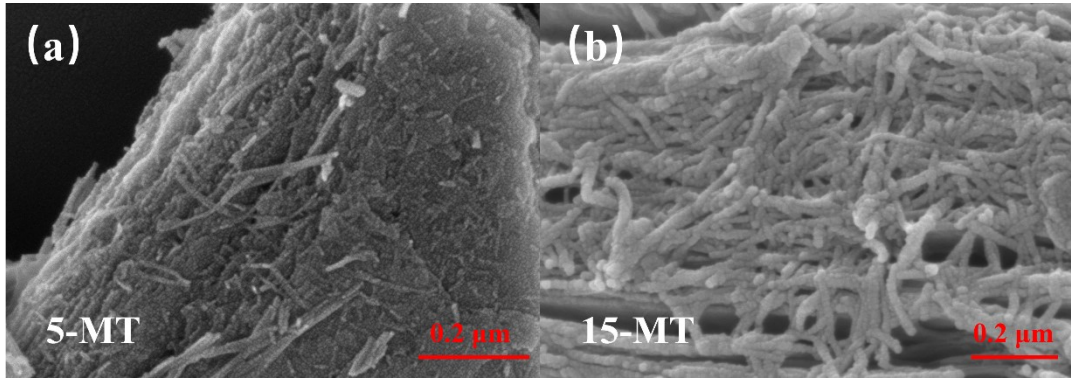
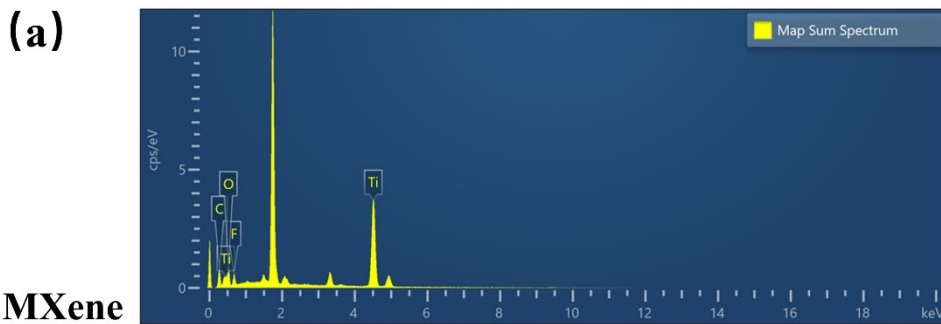
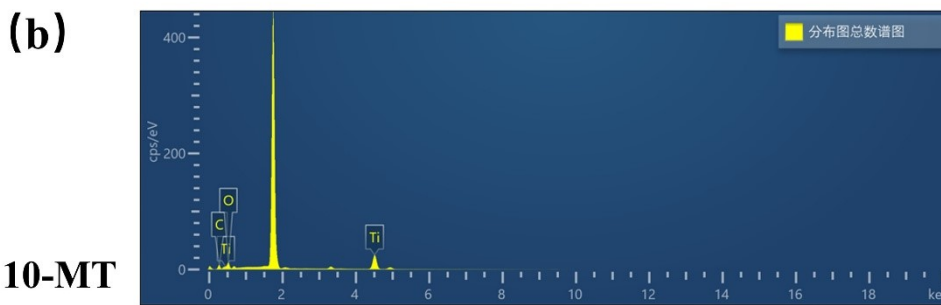


Fig. S1. FESEM image of (a) 5-MT and (b) 15-MT.



MXene

Map Sum Spectrum				
Element	Line Type	Weight %	Weight % Sigma	Atomic %
C	K series	13.27	0.39	27.31
O	K series	19.52	0.62	30.15
F	K series	10.03	0.42	13.04
Ti	K series	57.17	0.59	29.49
Total		100.00		100.00



10-MT

分布图总数谱图				
元素	线类型	重量百分比	Wt % Sigma	原子百分比
C	K 线系	23.64	0.34	38.29
O	K 线系	37.90	0.40	46.09
Ti	K 线系	38.46	0.30	15.62
总量		100.00		100.00

Fig. S2. EDX point-scan spectra and elemental quantification tables for (a) MXene and (b) 10-MT samples.

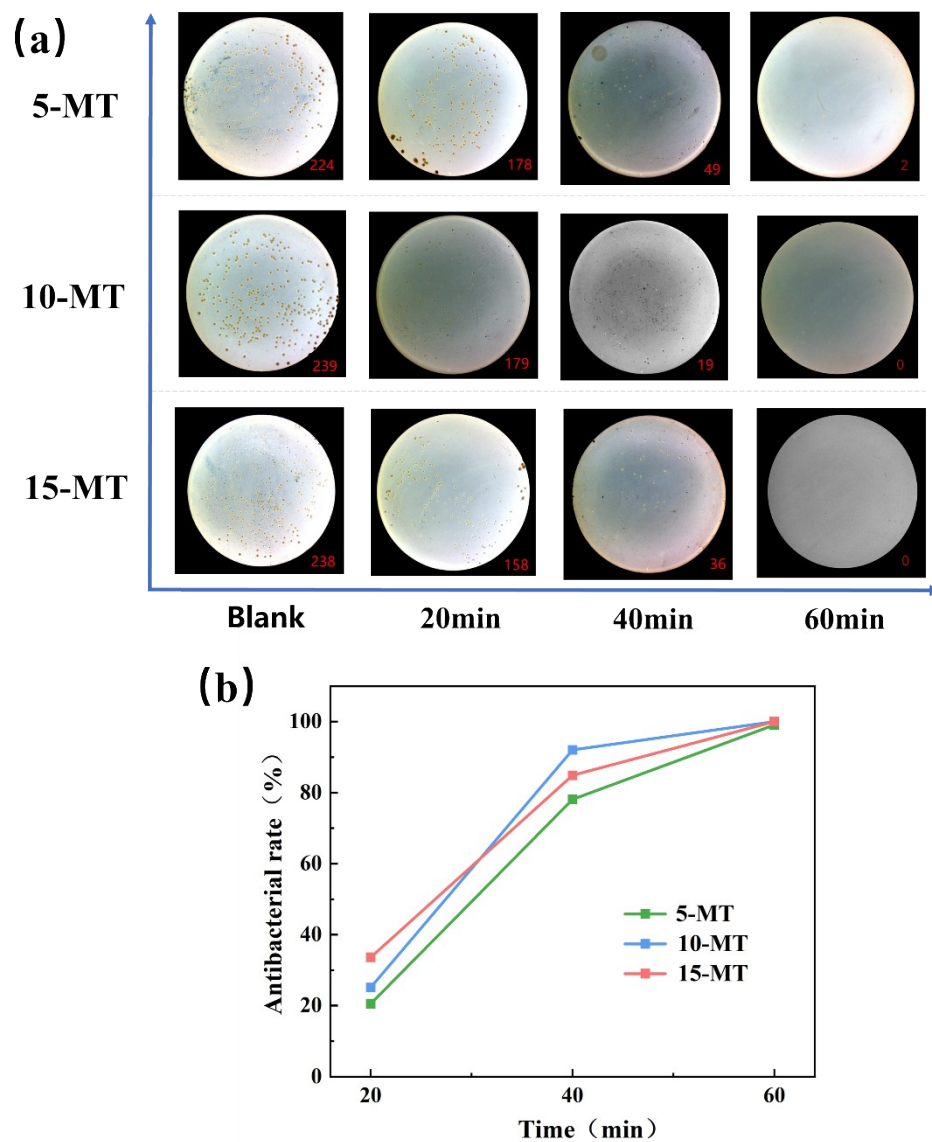


Fig. S3. Preliminary experiments on MT samples against E.coli (a) petri dish photos and (b) antimicrobial rate test at different catalytic times.

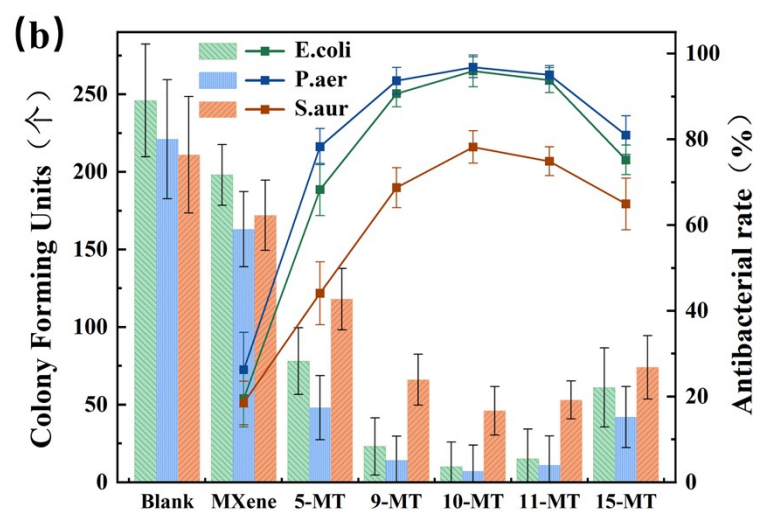
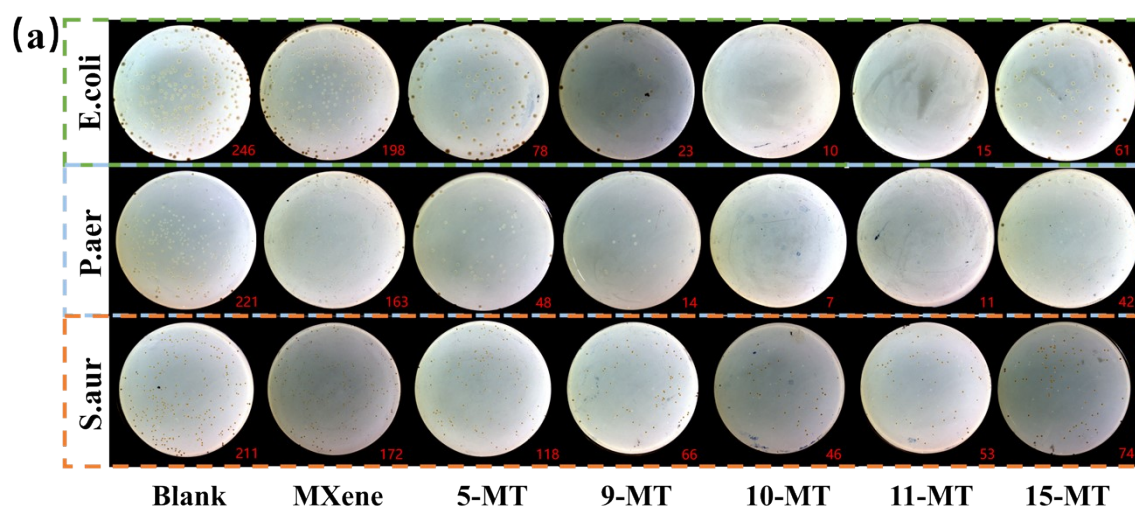


Fig. S4. (a) Photographs of piezoelectric catalytic sterilization Petri dishes and (b) piezoelectric catalytic antibacterial rates for MXene and all MT samples.

To further evaluate the cyclic performance of the samples, XRD and SEM analyses were conducted on the 10-MT before and after cycling. The results were shown in Fig. S5 and S6. The XRD results (Fig. S5) indicated that the characteristic diffraction peaks of TiO_2 and the low-angle diffraction peaks of MXene were both well preserved, suggesting that the 10-MT exhibited no significant structural changes before and after cycling. Meanwhile, FESEM (Fig. S6) revealed slight over-oxidation at the edges of the MXene, but the nanowires remained densely attached to the surface of the MXene nanosheets, and the overall morphology was still well preserved. The possible reasons for the slight decline in performance were as follows: during repeated high-speed centrifugation, nanowires with weaker bonding inevitably detached due to microscopic mechanical forces; furthermore, during continuous cycling, deactivated bacterial residues underwent irreversible adsorption, partially covering the piezoelectric catalytic active sites. Together, these two factors resulted in a slight decrease in performance. In summary, the catalyst exhibited good cycling stability.

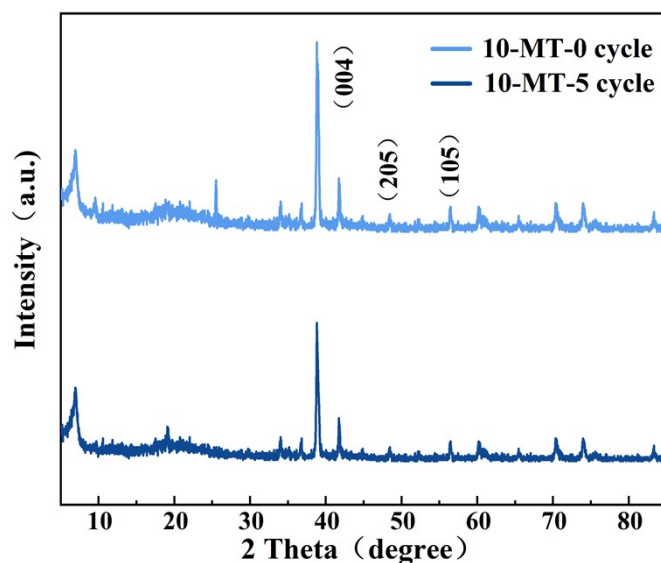


Fig. S5. XRD pattern of 10-MT after 5 antimicrobial cycles

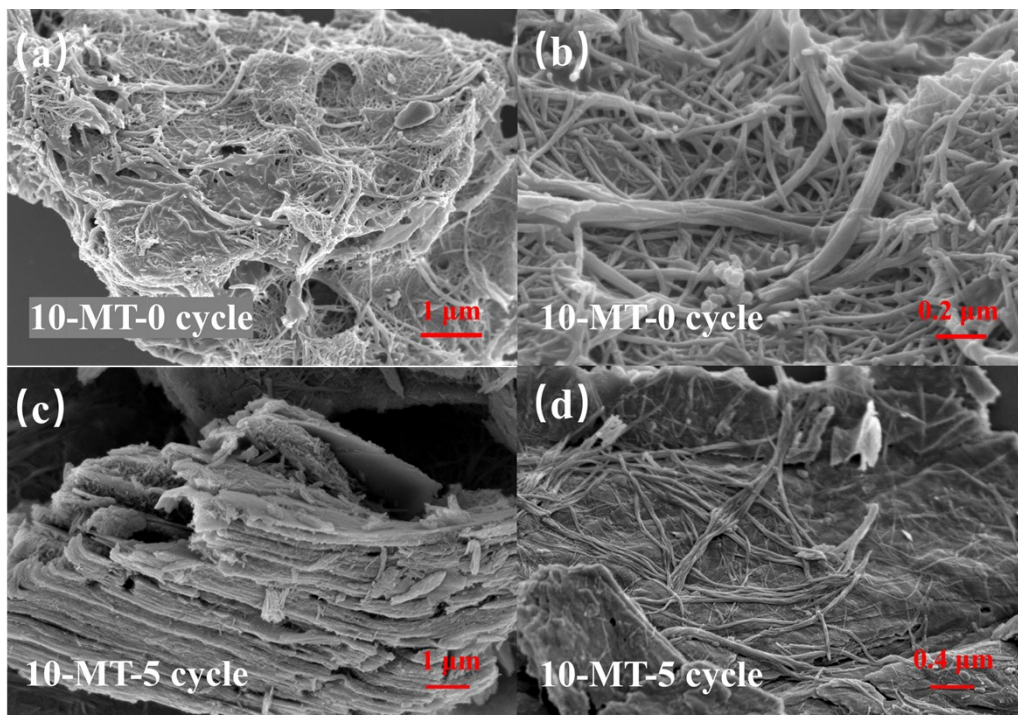


Fig. S6. FESEM images of 10-MT after 0 and 5 antimicrobial cycles

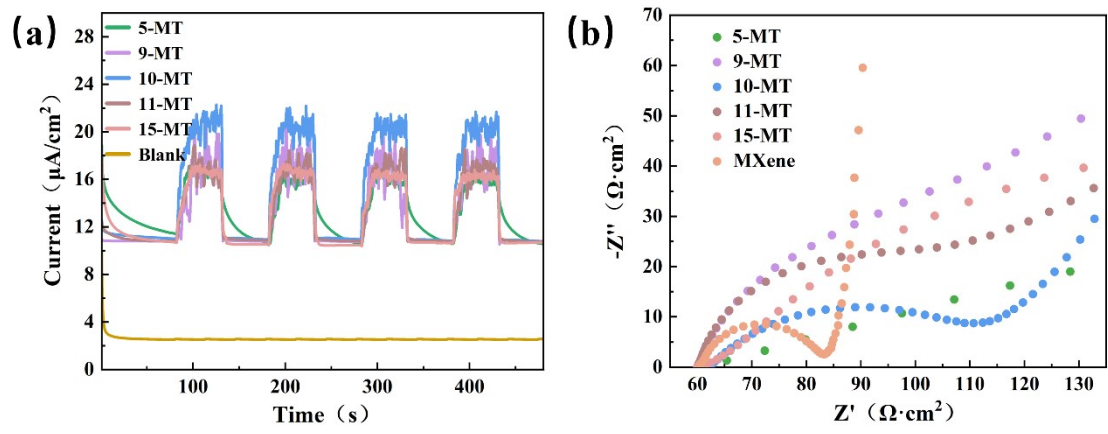


Fig. S7. (a) Transient current response of MT and blank ITO electrodes; (b) electrochemical impedance spectroscopy of MXene and MT samples.

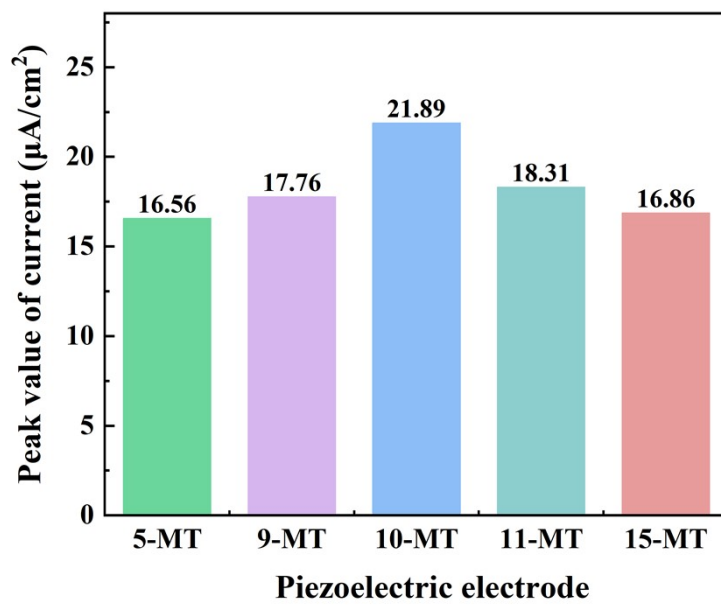


Fig. S8. Histogram of peak values of MT samples