Supplementary

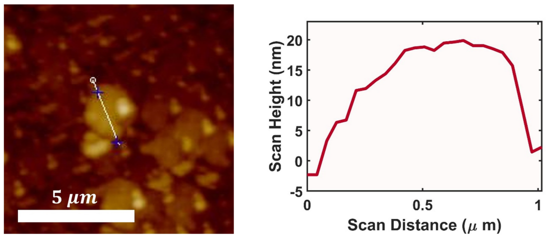

Fig. S1 Tapping mode AFM image of the surface of the multi-layered MXene flakes (left) and corresponding height scan (right).

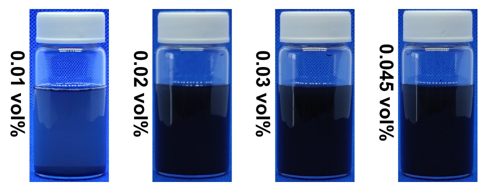

Fig. S2 Optical image of MXene-surfactant inks two weeks after storage in 4 °C condition. Left to right: 0.5, 4, 8 and 12 $mgmL^{-1}$ MXene concentration. Surfactant concentration is shown on the left.

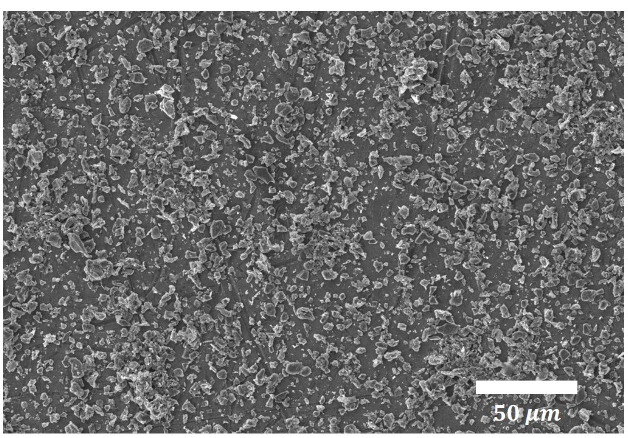

Fig. S3 SEM image of 12 $mgmL^{-1}$ MXene-surfactant ink after two weeks of storage in 4 °C condition, followed by 2 min of hand shaking and solution casted to dry on SEM holder. No significant agglomeration of MXene flakes was observed. Lateral dimension of MXene flakes were between 2 to 5 μm.

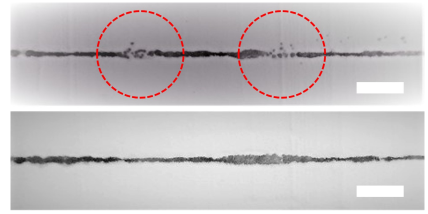

Fig. S4 Printed straight line with MXene ink (top) and MXene-surfactant ink (bottom). Red circle indicates discontinued line due to elastic collision from ink-powder surface energy mismatch. Printed line-width was (2.2 ± 0.3) mm. The scale bars correspond to 1 cm.

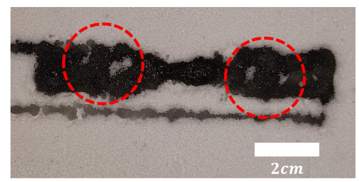

Fig. S5 ASTM Type V sample printed with MXene ink. The red circle indicates voids in sample due to elastic collision of ink with powder bed.

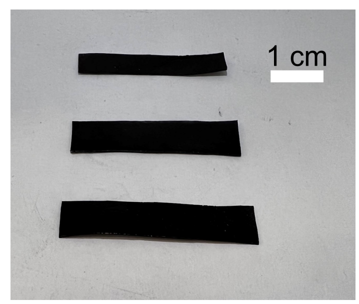

Fig. S6 Introducing controlled volume of surfactant mitigate elastic collision of ink with powder bed, enabling repeated printing of voids free samples.

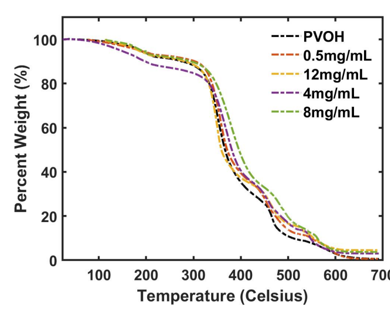

Fig. S7 Thermal gravimetric analysis of printed component. Remaining residue corresponds to MXene loading.

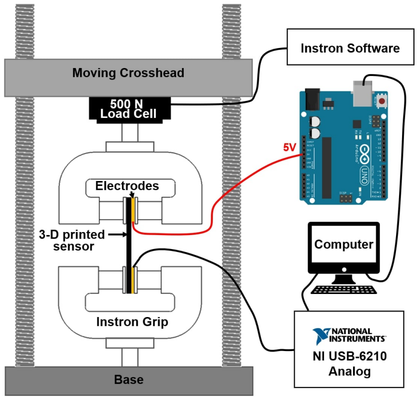

Fig. S8 Setup for tensile strain sensing using Instron Microtester 5848. BJ printed sensor was clamped to Instron grips with electrodes attached. 5 V was applied to the sensor and the response was recorded by National Instrument USB-6210 analog data acquisition box before signal analysis in MATLAB/Simulink. Strain data were also obtained from Instron software.

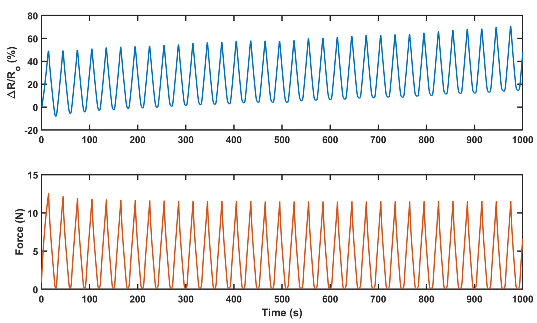

Fig. S9 Printed sample with $12\,\mathrm{mgmL^{-1}}$ MXene-surfactant ink did not suffer failure after 33 cyclic loading to 50% strain at an extension rate of $2\,\mathrm{mms^{-1}}$.

Equation to calculate jet velocity:

$$v = \frac{4Q}{\pi d^2} \tag{S1}$$

Where Q is the measured ink flow rate $\mathrm{mL^{-1}}$ and d is the needle inner diameter cm.

Equation to calculate capacitance of printed electrode using CV data:

$$C = \frac{2}{Ev}\int_{V_1}^{V_2} i\,dV \tag{S2}$$

Where E is the potential window ($E = V_2 - V_1$), V_2 and V_1 are the upper and lower bounds respectively. v is the scan rate in V/s. i is the discharge current in A and dV is infinitesimal changes in potential. C is the capacitance of the electrodes being tested in F. A coefficient 2 is used as the electrodes are connected in series.

Equation to calculate capacitance of printed electrode using GCD data:

$$C = I\int \frac{2}{V(t)}\,dt \tag{S3}$$

Where I is the applied constant current density in $\mathrm{As^{-1}}$, t is the discharge time in seconds, and $V(t)$ is the measured voltage as a function of time.

Equation to calculate energy stored in capacitor:

$$E = \frac{1}{2}CV^2 \tag{S4}$$

Where C is capacitance in F, V is the charged voltage of the capacitor, and E is the stored energy in J.

Equation for Herschel-Bulkley Model:

$$\tau = \tau_0 + k\dot{\gamma}^n \tag{S5}$$

Where τ is shear stress (mPa), τ_0 is the yield stress (mPa), k is consistency index, n is flow index and $\dot{\gamma}$ is shear rate (s^{-1}).

Equation to calculate shear stress at the needle wall? :

$$\tau_w = k\left(\frac{3n+1}{4n}\times\frac{8v}{D}\right)^n \tag{S6}$$

Where τ_w is the shear stress (mPa), n and k are extracted from Herschel-Bulkley model, v is the jet velocity of the ink ($\mathrm{ms^{-1}}$), and D is the diameter of the needle (μm).

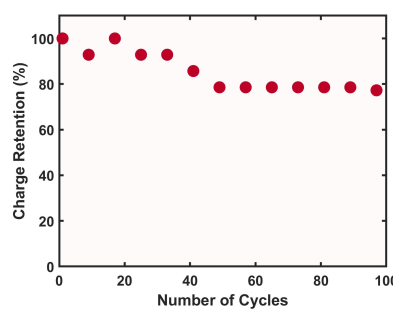

Fig. S10 Charge retention of printed electrode using $12\,\mathrm{mgmL^{-1}}$ MXene-surfactant ink tested with GCD methods.

Equation for Gauge Factor (GF):

$$GF = \frac{\Delta R/R_0}{Strain(\%)} \tag{S7}$$

Where ΔR is the change in resistance, R_0 is the initial resistance, and strain corresponds to applied strain.