Viscoelastic Behaviour of Freestanding Cellular Lattices Made of $Ti_3C_2T_x$ MXene

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Two-dimensional (2D) materials, such as graphene and MXenes, exhibit multifunctionality due to their wide range of outstanding properties. Thus, they represent appropriate solutions for many technological challenges [1]. Investigating the various properties of such materials in various freestanding three-dimensional (3D) architectures is essential. The mechanical properties of rGO lattices showed high sensitivity toward the relative density, lattice's architectures, and the number of unit cells [2]. Similarly, gyroidal cellular lattices made of $Ti_3C_2T_x$ MXenes exhibit ultrasensitive micromechanical sensing applications [3]. High sensitivity (139 Pa-1) was achieved by refining the dip coating process which makes it an appropriate candidate for multifunctional application. Additive manufacturing (AM) of customized architecture, made of freestanding 2D materials, showed a high capability to acquire preferable properties [4]. Accordingly, investigating the mechanical performance and viscoelastic behaviour of such lattices is of interest. Additionally, optimizing the structural parameters to get robust lattices for multifunctional applications is crucial.

References

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Figures

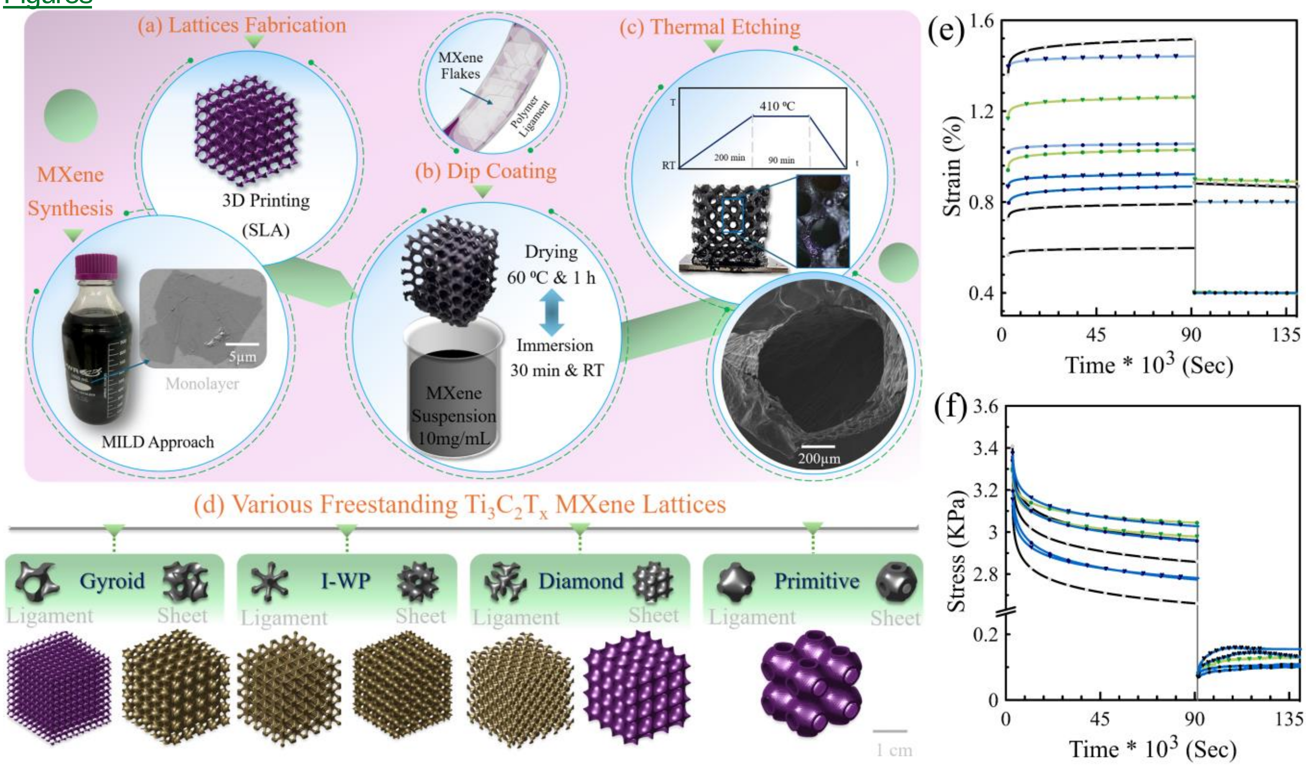

Figure 1: Fabrication of free-standing MXene lattices via dip-coating approach, starting by (a) Fabrication of the castable wax scaffolds then, (b) Dip coating in MXene suspension, and (c) Thermal etching. (d) Images of the fabricated MXene Lattices with various architectures. (e) Creep behaviour, and (f) Stress relaxation curves of MXene lattices.