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Facile Spin-Coating of 2D Ti_3C_2-MXene/AuNPs Nanocomposites in a PMMA Matrix: Toward Stable Coatings for Memristive Applications

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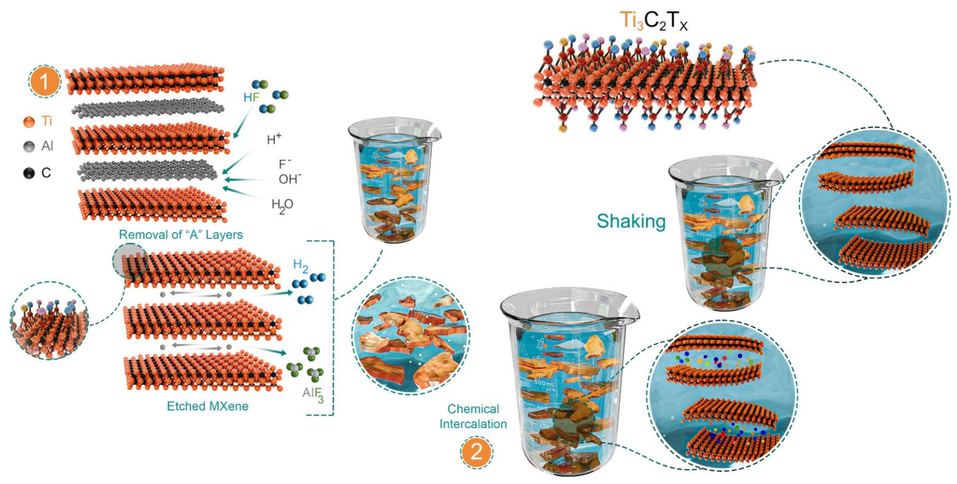
INTRODUCTION

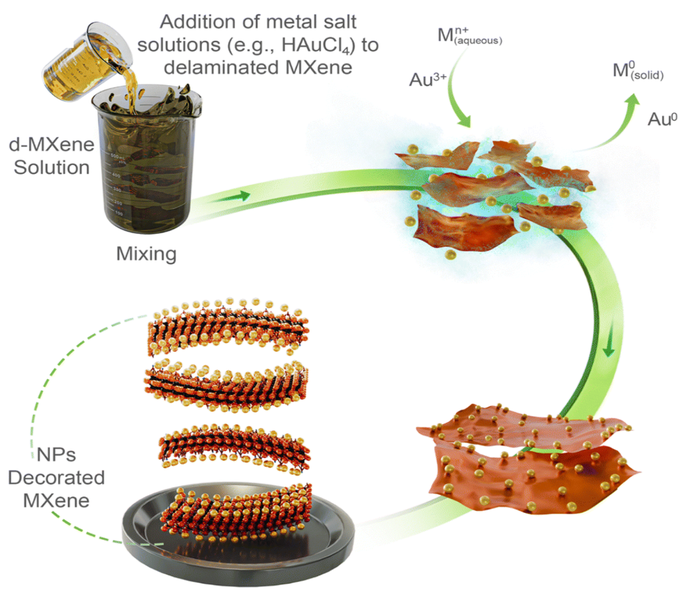
2D MXenes provide high conductivity and solution processability, making them promising materials for future energy and electronic systems. In this study, we optimise a spin-coating strategy for Ti_3C_2 MXene decorated with gold nanoparticles (MX@AuNPs) dispersed in a PMMA matrix to obtain homogeneous coatings. By systematically tuning solvent selection, PMMA concentration, and MX@AuNPs loading, we achieve stable and uniform thin films. This work establishes a robust processing route for MXene-based composites toward scalable semiconductor and memristive device applications.

METHOD

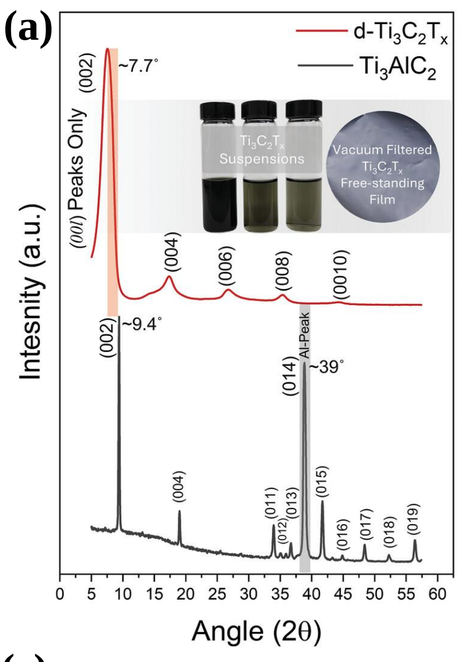
Synthesis and delamination of MXene

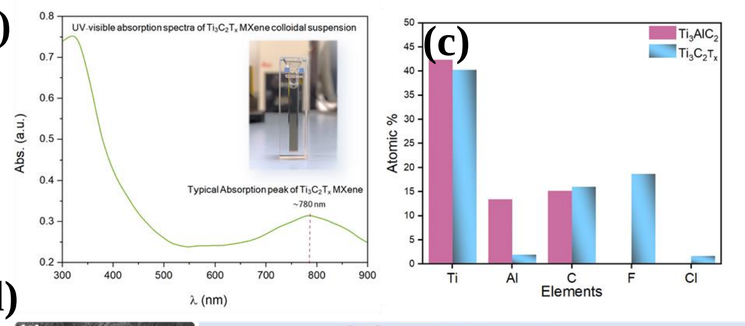


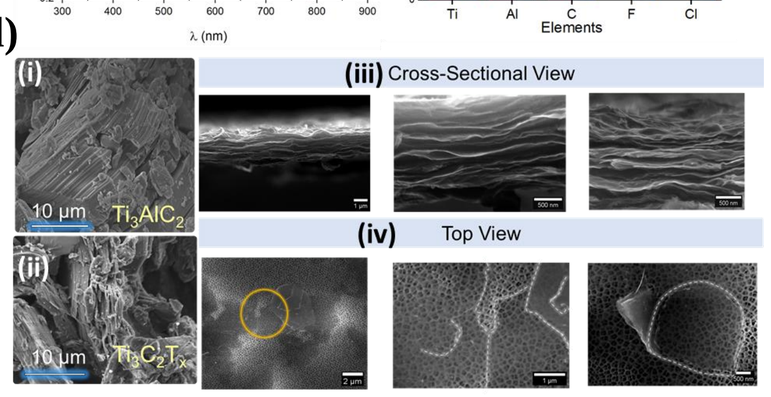
Synthesis of MX@AuNPs Composite

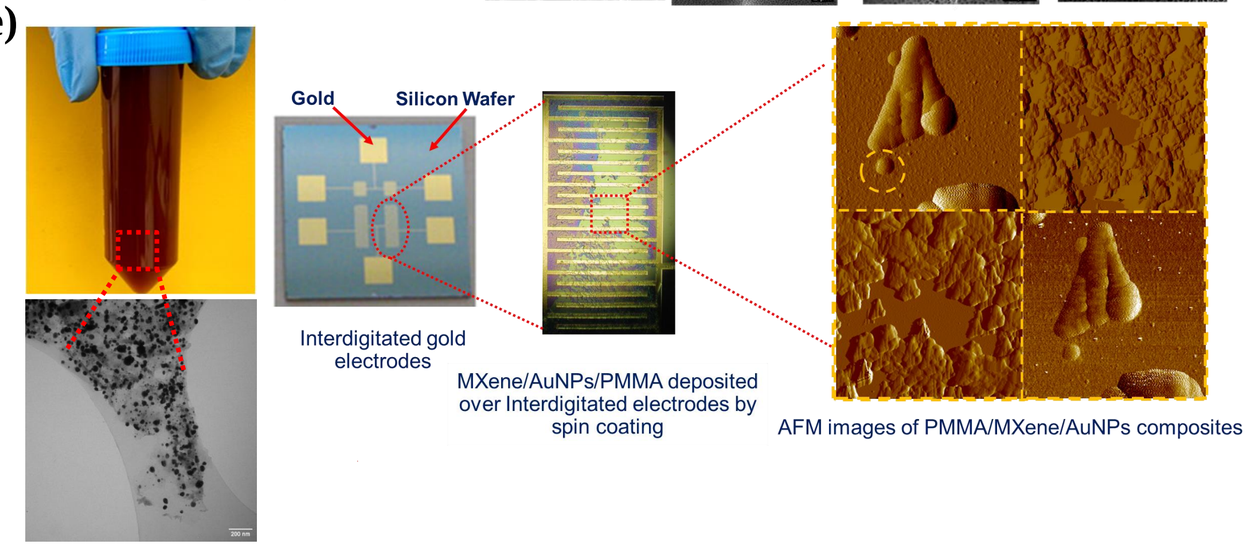


RESULTS & DISCUSSION









(a) XRD of Ti_3AlC_2 MAX and delaminated **$Ti_3C_2T_x$ MXene**. **(b)** UV–Vis and **(c)** EDX spectra show successful synthesis. **(d)** SEM images of **MAX**, and MXene **(e) MX@AuNPs** composite synthesis, **PMMA**-assisted coating on interdigitated electrodes, and AFM imaging of the resulting films.

KEY FINDINGS

- **Ti_3C_2 MXene** decorated AuNPs were produced by In-situ self reduction approach.
- Stable, homogeneous **MX@AuNPs/PMMA** films were achieved using an optimized spin-coating protocol.
- **DMF** provided the most stable dispersions compared to chloroform and acetone.
- Tuning PMMA concentration (**1.6–8.3 wt%)** and **MX@AuNPs** loading (**1.5–3.0 wt%)** enabled reproducible and uniform thin-film formation.

About me

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