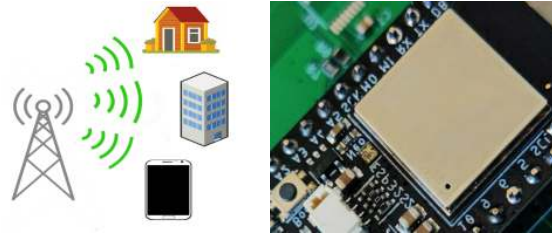


STATUS QUO

EMI shielding for 5G NR in Ka-band



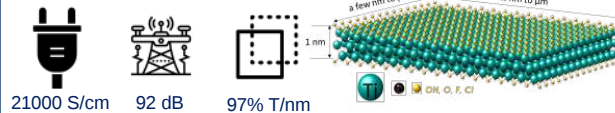
- ✓ EMI shielding required: at Ka-band, avoid EM pollution and information leakage caused by interconnect lines in electronic products.
- ✓ Traditional materials for electronic packaging are often heavy, thick, high cost, and lack flexibility.



NEW INSIGHTS

$\text{Ti}_3\text{C}_2\text{T}_x$ with excellent EMI shielding performance

- ✓ Materials Characteristics

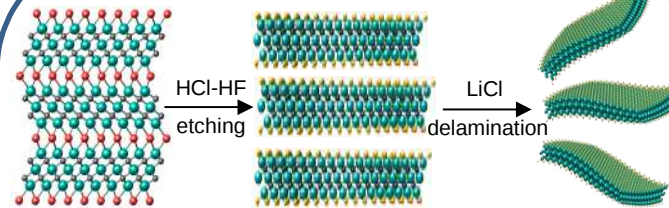


- Natural multilayer structure inside $\text{Ti}_3\text{C}_2\text{T}_x$ MXene films, facilitates EM waves to be reflected and absorbed multiple times within each layer.
- ✓ EMI Shielding Effectiveness
- Exceptionally high shielding efficiency per unit density and thickness is achieved compared to conventional materials.

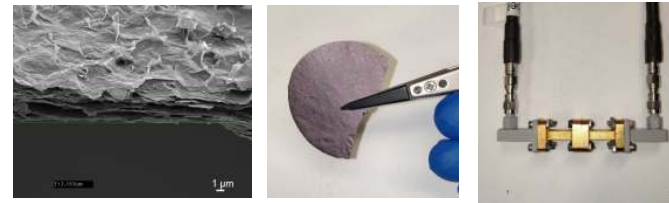
DESCRIPTION



Synthesis of single-to-few layered $\text{Ti}_3\text{C}_2\text{T}_x$ MXene



- ✓ $\text{Ti}_3\text{C}_2\text{T}_x$ MXene film is prepared by vacuum-assisted filtration of colloidal MXene suspension.

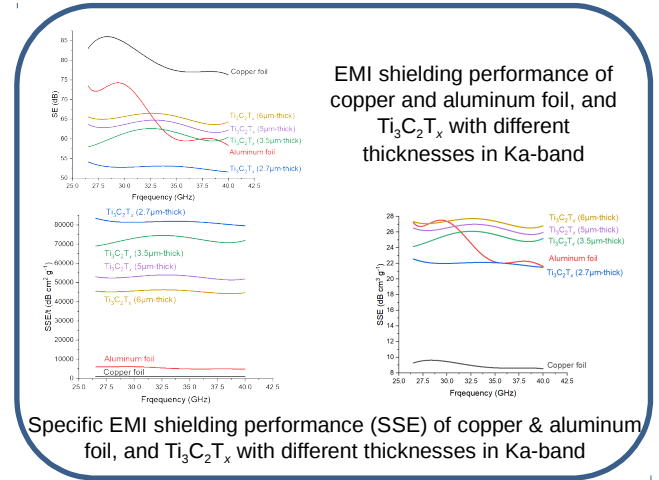


Measurement of EMI performance:

- ✓ **Measurement Setup**
 - Two-port network analyzer (8722ES, Agilent Technologies) with two WR-28 waveguides.
 - EM waves from 26.5 GHz to 40 GHz with a power of 0 dBm.
 - MXene films in different thicknesses (2.7 μm , 3.5 μm , 5 μm and 6 μm).
- ✓ **Specific EMI SE**
 - Standard EMI shielding effectiveness, derived from S-parameters, is affected by measurement frequency and material conductivity.
 - Considering material density and thickness, two specific shielding effectiveness measures (SSEs) are determined.
 - Higher electrical conductivity with lighter density and thickness achieves superior SSE performance.



QUANTITATIVE IMPACT



PROPOSED CONCEPT GOALS

$\text{Ti}_3\text{C}_2\text{T}_x$ MXene films featuring:

- ✓ Excellent EMI shielding performance with high electrical conductivity, lightweight, thin and stable.
- ✓ Additive-free inks with the possibility of simple printing or molding on different surfaces and substrates.
- ✓ With their ease of processing and fabrication, MXenes are ideal for next-gen EMI shielding and miniaturization of electronic devices for 5G and beyond.