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Study of new materials for electromagnetic shielding in the frequency range of 5G technology

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The 5G technology is having a significant impact on the communication industry. One of the 5G challenges is the design of new shielding materials able to reduce electromagnetic interferences (EMI) that allow 5G to coexist with other technologies.

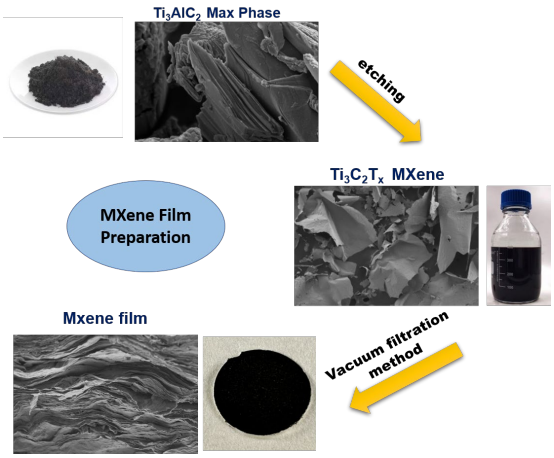

Figure 1 – MXene Film synthesis

Traditional metal shields can effectively attenuate EMI generated by 5G applications, but they generally have some drawbacks, such as lack of flexibility, high weight and volume, or low corrosion resistance. A new 2D material family of transition metal carbides or nitrides known as MXene with unique sets of properties has attracted growing attention for EMI shielding applications [1]. MXene material show excellent metallic conductivity, which is the highest among synthetic 2D materials because of their electron density near the Fermi level (EF) [2]. In this study, $Ti_3C_2T_x$ MXene was synthesized by a minimally intensive layer delamination (MILD) method from Ti_3AlC_2 precursor (MAX phase) [3].

Flexible MXene thin films (~8 μm) were obtained from aqueous $Ti_3C_2T_x$ dispersions by vacuum-assisted filtration (VAF) method. The dense arrangement of MXene nanosheets in the films contributes to enhance shielding effectiveness (SE). Previous studies found that the MXene flakes tend to degrade in humid air [4]. Nevertheless, the stability of MXene films and the effect on the SE of these materials remains largely unexplored. This contribution is focused on the stability and degradation of MXene films in a humid atmosphere and its impact on shielding effectiveness performance. The shielding effectiveness is measured with an innovative method that makes it possible to extend the frequency limit defined by the standard ASTM 4935-18 for measuring the electromagnetic shielding effectiveness of planar materials. Therefore, it is possible to determine the SE parameter of these new materials in the FR1 5G frequency region (up to 7.125 GHz). The results obtained demonstrate significant and flatness responses compared with other alternative shielding materials.

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