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# Understanding the structure-property relationship of 2D nanomaterials during solution processing using SAXS/WAXS

Due to its unusual mix of electrical conductivity, large surface area, and good dispersibility in a variety of liquids, the 2D nanomaterial MXene recently gained enormous attention. In order to create functional macro structures from nanomaterials, a few solution processing techniques, including as wet-spinning, coating, printing, and freeze casting, are favoured because to their superior dispersibility in solvents. In our studies, the highly electrical conducting pure MXene fiber (ACS Central Science 2020, 6 (2), 254-265.) and composite fiber (Journal of Materials Chemistry A 2022, 10 (9), 4770-4781.) are spun from their dispersions and SAXS/WAXS is introduced to reveal the orientation of MXene sheets in different spinning conditions. Additionally, the SAXS/WAXS investigation shows that MXene nanosheet alignment and orientation have a significant impact on the properties of their macrostructures. For instance, the excellent mechanical strength and EMI shielding performance is attributed to the aligned and tightly packed MXene sheets following blade coating (Advanced Materials 2020, 32 (23), e2001093. Advanced Materials Interfaces 2021, 8 (7), 2002043.). Furthermore, using in-situ SAXS, we first investigated the orientation changes as a function of share rate, nanosheet size, and concentration, respectively. Understanding the effect of sharing force on 2D MXene orientations is crucial to achieving advanced control over macroscopic alignments and macroscale properties. In addition to offering fresh insight into the material characteristics, the successful coordination of SAXS/WAXS and advanced materials research also looks at the possibilities of using SAXS/WAXS to bridge the gap between structural preparation and structural performances.

## Level of Expertise

Early Career <5 years

## Presenter Gender

Man

## Pronouns

He/Him

## Do you intend to attend UM2022

In person - Melbourne

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