2D Layered Frameworks for Sustainable Energy Storage Applications

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Significant research attention has been directed towards two-dimensional (2D) layered frameworks, which have emerged as a novel class of multifunctional materials. Notable examples within this category include 2D covalent organic frameworks and 2D conjugated metal-organic frameworks. These frameworks are characterized by their regular porosities, large specific surface areas, and remarkable chemical stability. Furthermore, 2D porous frameworks display unique features, such as customizable topologies and well-defined redox-active sites, prompting an increased exploration of their potential in electrochemical energy storage applications. [1] In this presentation, I will present how 2D porous frameworks appear as promising alternatives for electrodes in next-generation energy storage devices. This will be exemplified through instances such as the utilization of 2D polyimide covalent organic frameworks in multivalent metal batteries [2-3] and the application of 2D conjugated metal-organic frameworks as attractive pseudocapacitive electrodes [4-5]. Additionally, I will showcase our recent efforts in investigating 2D crystalline polymers as effective interfacial coatings for batteries [6-7]. These coatings facilitate efficient interfacial ion transport and charge transfer, thereby significantly enhancing overall electrochemical reaction kinetics, reversibility, and durability.

References

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Figures

Figure 1: 2D layered c-MOFs and COFs for sustainable energy storage applications.