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**Hierarchical graphene materials: from monolayers to papers and nanocomposites** ZHIPING XU, Tsinghua University — Macroscopic graphene materials such as papers and nanocomposites consist of chemically modified graphene sheets and intersheet crosslinks of various types, which hold great promises in high-performance, multifunctional and light-weighted applications. In this talk, we will present a multiscale approach (density functional theory, molecular dynamics and continuum mechanics) to understand simultaneously atomistic mechanisms, microscale structures and microscopic performance of these hierarchical graphene materials, and provide general principles for materials design that are supported by experimental evidence. Hierarchical structures of graphene-based materials will be also discussed comparably with biological materials that are widely studied recently, such as bones, nacre and collagen fibrils, which possess similar materials hierarchies and inspire many novel concepts in new materials development.

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