

High Frequency Sonochemistry: A New Field of Cavitation-Free Acoustic Materials Synthesis and Manipulation

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Abstract : Ultrasound presents a powerful means for material synthesis. In this talk, we showcase a new field demonstrating the possibility for harnessing sound energy sources at considerably higher frequencies (10 MHz to 1 GHz) compared to conventional ultrasound (kHz and up to ~2 MHz) for crystallising and manipulating a variety of nanoscale materials. At these frequencies, cavitation—which underpins most sonochemical processes—is largely absent, suggesting that altogether fundamentally different mechanisms are at dominant. Examples include the crystallization of highly oriented structures, quasi-2D metal-organic frameworks and nanocomposites. These fascinating examples reveal how the highly nonlinear electromechanical coupling associated with high-frequency surface vibration gives rise to molecular ordering and assembly on the nano and microscale.

Keywords : high-frequency acoustics, microfluidics, crystallisation, composite nanomaterials

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