Mechanical Energy Absorption of Metal-Organic Frameworks

Dr Yueting Sun, Department of Mechanical Engineering, University of Birmingham

Energy absorption materials and structures are important to provide protections from mechanical impact, vibration, or explosion. The high surface area and porosity offered by metal–organic frameworks (MOFs) can be exploited to develop efficient energy absorption materials based on solid–liquid interactions or framework deformations under mechanical pressure. In these processes, the energy absorption can be amplified by the internal surface area and porosity of MOFs and therefore holds great potential compared to conventional materials. For example, the pressurised intrusion of non-wetting liquid into MOF nanopores can absorb mechanical energy and mitigate impact by generating a large solid–liquid interface within a short period of time. This talk will give an overview of our work in this area, I will start from the concept of nanofluidic energy absorption in nanoporous materials, and introduce our recent development in understanding behaviours at different loading rates and conditions, exploring the scope for material design, developing engineering solutions, and bringing in new characterisations for potential applications in different areas, etc. I hope this talk and research topic can offer new opportunities for discussions and collaborations between chemistry and engineering.