Professor Yulong Ding, University of Birmingham

Short Bio

Professor Ding is founding Chamberlain Chair of Chemical Engineering and founding Director of University of Birmingham Centre for Energy Storage. His research has been on energy materials and processes. He has published 550+ technical papers with 450+ in peer-reviewed journals (GS H-Index ~80) and filed 100+ patents. He currently serves on The Royal Society Net Zero Panel and IChemE Publication Medal Assessment Panel, and recently led a Royal Society briefing note on heating and cooling in Climate Change: Science and Solutions. He invented liquid air energy storage technology and led the initial stage of technology developments (Highview Power). He developed composite phase change materials for thermal energy storage and associated large-scale manufacture technologies, leading to large scale commercial applications with a total installation of >300MW / >1.5GWh so far (Jinhe Energy). His work on passively cooled container technology has been on large scale commercial demonstration for cold chain applications (CRRC). His work has been recognised by the ESIE Outstanding Achievement Award (2022), the IChemE Clean Energy Medal (2021); the election to Fellow of Royal Academy of Engineering (2020); the IChemE Global Awards in three categories of Energy, Research Project and Outstanding Achievement (2019); and Energy & Environment Award and Technology and Innovation Grand Prix Award ('The Engineer', 2011).

Title: Thermal Energy Storage Using Composite Phase Change Materials - From Materials, to Devices, and System Integration and Optimisation

Abstract: Thermal energy storage (TES) refers to a collection of technologies that store energy in the form of heat, cold or their combination, which currently accounts for approximately 55% of global non-pumped hydro storage installations. This presentation will first briefly outline the background and challenges of thermal energy storage. Recent progress will then be summarized in TES materials, components and devices and system integration. TES can be

sensible heat, latent heat or thermochemical based. This talk shall use the latent heat storage using phase change materials (PCMs) as an example, particularly inorganic salts based PCMs. Two key challenges for such materials are chemical incompatibility and low thermal conductivity. The use of composite PCMs provides an avenue to meeting the challenges. Such composite materials are porous, using a structural supporting material and a thermal conductivity enhancement material. It will show that a right combination of the salt, the structural supporting material and the thermal conductivity enhancement material could give a hierarchical structure that is able to contain the molten salt and give a substantial enhancement in the thermal conductivity.