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In this talk I present some new thoughts to clarify the impact of nanostructuring and polyamorphic transitions on both glass functionality and glass formation, respectively. I emphasize the role of the order/disorder interplay in dictating material functionalities by analyzing the following two cases reported in [1,2].

First, a kind of multiphase nanostructured glass as a cathode material has been developed by using the bio-template approach to improve the performances of lithium ion batteries [1]. The nanostructure, along with the mesoporous glass phase, has provided effective sites for storing Li^+ ions and for easier transfer kinetics of electrons and lithium ions, and hence has displayed the superior discharge capacity and ultra-high Coulombic efficiency. Here I give some new implications on the microscopic mechanisms of the enhancement of the electrochemical performances of the new cathode materials.

Second, when a single crystalline metal-organic framework (MOF) undergoes a well-controlled dynamic heating process in DSC, it collapses into a low density amorphous (LDA) phase, and then is immediately transformed into a high density liquid phase state followed by re-crystallization, subsequent melting and final disassociation [3]. However, when the liquid phase prior to crystallization is cooled, a high density amorphous (HDA) phase is obtained. When the HDA phase is reheated, it undergoes a glass transition. Remarkably, when re-crystallized HDA phase is melted and then quenched, even a bulk MOF glass can be obtained [2]. Here I describe thermodynamic and dynamic aspects of formation of the bulk MOF glasses by analyzing their thermal histories.

References:

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2. T.D. Bennett, J.C. Tan, Y.Z. Yue, H. Yeung, S. Henke, S. Cao, A.K. Cheetham, G.N. Greaves, *arXiv:1409.3980, [cond-mat.mtrl-sci]*