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Nano-Mechanics Foundations and Experimental Methodologies for Multiphysics Prognosis of Functional Behavior in Heterogenous Functional Materials (HeteroFoaMs)

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The present paper will discuss the nano-mechanics foundations and experimental methodologies that provide a foundation for the prognosis of the functional behavior of nano-structured heterogeneous materials for energy systems. The principle objective of this work is the creation of conceptual foundations for prognosis of heterogeneous functional materials. Our approach is to focus on the nano-mechanics associated with the nano-structural configurations and interfaces (function and geometry) of the active phases. The paper will discuss conceptual foundations, experimental methods, and computational and analysis methods that associate global functional response of interest to energy conversion and storage with the multiphysics of nano-structured heterogeneous materials. New experimental room-temperature, non-invasive interrogation methods for establishing internal integrity as a function of operation history will also be introduced and discussed as an example.

Keywords: heterogeneous;functional materials;multiphysics;HeteroFoaM;nano-mechanics;

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