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COMPUTATIONAL MECHANICS FOR ENERGY HARVESTING AND STORAGE

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ABSTRACT

Faced as we are with the global environmental deterioration, policies to reduce carbon dioxide emission and to promote cleaner, less polluting technologies must be advocated. Rapid deployment of renewable energy plans will result in significant carbon dioxide reduction, climate change mitigation, and economic benefits. Renewable energy is derived from natural processes that are replenished constantly but that unfortunately have an intermittent quality. The processes are not adjustable to contingent conditions. Therefore, both the abilities to harvest as well as to store energy are strategic.

The present realities, however, are not yet at such a technological level to meet the requirements of ambitious actions to tackle climate change, as for powering electric vehicles to displace fossil fuel transport systems. Whereas experimental studies are the backbones of materials and devices investigation, modeling can provide fundamental contributions, particularly in tailoring material performances and predict their aging and degradation.

Theoretical models for energy harvesting and storage require multi-physics and often multi-scale approaches, whereas computational analyses make large use of high performance computing. This mini-symposium welcomes formulations and concepts that face current challenges - as the lack of full 3D multi-scale modeling of the multi-physics processes from atomistic to continuum, of detection of hot spots generation, modeling phase-segregations and mechanical failure.