MARCH MEETING 2019
BOSTON, MA MARCH 4-8

APS March Meeting 2019
March 4-8 • Boston, MA

From March 4 to 8, Boston will transform into the hub of physics as more than 11,000 attendees arrive for the APS March Meeting 2019. Showcase your work for a global audience of physicists, scientists, and students representing 28 APS units and committees to explore groundbreaking research from industry, academia, and major labs. See the members of the committee working on this year's program.

Meeting Location

- Venue: Boston Convention and Exhibition Center (BCEC)
- Headquarter Hotel: Westin Boston Waterfront

Explore the Meeting

- View the Scientific Program
- View the Schedule of Events
- View the Future of Physics Days (Undergrads)

1:51PM B47.00014: Uncovering Biaxial Strain Effect on Nanoparticle Exsolution for Thin-film Perovskites JIAYUE WANG (Presenter), MIT, ALEXANDER OPITZ, TU Wien, ROLAND BLIEM, WILLIAM BOWMAN, XIAHUI YAO, MIT, ANDREAS NENNING, TU Wien, GEORGIOS DIMITRAKOPOULOS, MIT, IRADWIKANARI WALUYO, ADRIAN HUNT, Brookhaven National Lab, JEAN-JACQUES GALLET, SOLEIL synchrotron, BILGE YILDIZ, MIT — Environment-friendly approaches are being advanced to synthesize carbon-neutral fuels. Many of these technologies rely on catalytically highly active nanoparticles that are supported on oxides. A recent advance in such catalyst design is to exsolve catalytic metal nanoparticles at the surface of a supporting oxide. Unlike traditional deposition techniques, the nanoparticle catalysts from exsolution are anchored in the parent oxide. This strong metal-oxide interaction makes the exsolved nanoparticles more resistant against particle agglomeration. In addition, the exsolved particles also open up the possibility of regeneration of catalysts.

In this work, $La_{0.6}Sr_{0.4}FeO_{3-\delta}$ (LSF64) thin films are employed as model systems and the biaxial strain is introduced by growing LSF64 thin films epitaxially on substrates with different lattice constants. Coupling surface chemical information from *in-situ* ambient pressure X-ray spectroscopy with morphological and structural information from electron microscopy, we found that in-plane biaxial strain can be a powerful tool in optimizing the particle dispersion of the exsolution products. The observed strain dependence of exsolution advances our abilities to control them and enhance the performance of catalysts for clean energy technologies.

Monday, March 4, 2019 11:15 AM - 1:15 PM

Session B48 DFD GSNP: Fluid-Structure Interactions (FSI) I BCEC 251 - Yahya Modarres-Sadeghi, Univ of Mass - Amherst - Tag(s): Focus

11:15AM B48.00001: Wave interaction with flexible vegetation: connecting individual blade dynamics to meadow scale wave decay* [Invited] JIARUI LEI, HEIDI NEPF (Presenter), Massachusetts Institute of Technology — Flexible plants move in response to wave orbital velocity, which diminishes wave decay relative to rigid plants. The impact of reconfiguration and blade motion on wave decay has been characterized using an effective blade length, l_e, which represents the length of a rigid blade that generates the same drag as the flexible blade of length l. The effective blade length depends on the Cauchy number, which represents the ratio of hydrodynamic drag to blade stiffness, and on the ratio of blade length to wave orbital excursion. This laboratory study considered how scaling laws determined for individual blades could be used to predict the wave decay over a meadow of multiple plants. First, the drag force on and motion of individual model blades was studied for a range of wave conditions to provide empirical coefficients for the theoretically determined scaling laws for effective blade length, l_e . Second, the effective blade length predicted for individual blades was incorporated into a meadow-scale model to predict wave decay over a meadow. Third, wave decay was measured over meadows of different plant density (shoots per bed area), and the measured decay was used to validate the wave-decay model.

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11:51AM B48.00002: An Eulerian method for mixed soft and rigid body interactions in incompressible fluids XIAOLIN WANG (Presenter), Harvard University, KEN KAMRIN, MIT, CHRISTOPHER RYCROFT, Harvard University — Fluid-solid interaction problems are encountered in many engineering and biological applications, but are challenging to simulate due to the coupling between the two material phases. Here, we propose a fully Eulerian approach for solving fluid-solid interactions that is simple to implement and capable of simulating complex multi-body interactions. When the solid is rigid, a projection step is formulated as a composite linear system that simultaneously enforces the rigidity and incompressibility constraints. When the solid is soft, a reference map technique is applied to characterize the body deformation in an Eulerian framework. Several examples including a single body, multiple bodies, and soft-rigid combinations will be presented, with potential applications to biological systems.

12:03PM B48.00003: A Method for Deriving Fluid-Structure Interaction Reduced-Order Models for Cerebral Aneurysms SUYUE HAN (Presenter), YAHYA MODARRES-SADEGHI, University of Massachusetts Amherst — A Reduced Order Modeling (ROM) method is discussed for Fluid-Structure Interaction problems in cerebral aneurysm. In this method, we first conduct training CFD simulations with pre-defined structural motion using the fixed mesh method, and then use the snapshot POD method to generate POD modes for both the flow field and the structure. Instead of using traditional topology-changing method, the CFD simulation is enhanced by a fixed mesh method to handle large-amplitude displacements or structural deformation without changing the mesh connectivity, thus consuming much less time. The POD ROM method is also enhanced by the same fixed mesh method, so that the training CFD simulation could be combined with the ROM smoothly. Besides, by implementing a fixed mesh method into the ROM, there is no need for iteratively calculating the forces acting on the structure for every time step. After generating POD modes for both the fluid and the structure using a fixed mesh, we couple these fluid and structure POD modes to create the FSI ROMs.