ABSTRACT SYMPOSIUM NAME: Engaging Students in Physical Chemistry
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TITLE: Introducing the chemistry of molten salts in the nuclear engineering curriculum
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ABSTRACT BODY:
Abstract: High temperature molten salts have a broad range of applications in sustainable energy and manufacturing. Their application to nuclear energy is seeing a resurgence: more than a dozen start-up companies are pursuing molten salt or salt-cooled reactors, supported by private and government investment both in the U.S. and abroad. In order to meet the needs of a rapidly growing new industry, the undergraduate and graduate curriculum in nuclear engineering needs to adapt to train students on the fundamentals of molten salts. Over the past few decades, chemistry, physical chemistry or electrochemistry have not been a major element of nuclear engineering. Even though historically, a number of nuclear energineering departments were founded from chemical engineering departments, at present many nuclear engineering departments are part of or closely related to mechanical engineering. Conventional nuclear technology relies on water-cooled reactors and solid fuel, and the curriculum focuses on neutron transport two-phase heat transfer and material degradation under irradiation. Molten salt reactors, however, cannot be designed or analyzed without an understanding of physical chemistry. In molten salt reactors, uranium fuel is dissolved in high temperature molten salts. The fission products of uranium are then produced in the molten salts, generating a liquid solution of a mixture of the large majority of the elements in the periodic table. Understanding and predicting the fate of each of the elements is at the basis of molten salt reactor design and safety analysis. Phase diagrams need to be understood, and the thermodynamics of the very complex mixture needs to be understood and controlled. A joint team from University of Wisconsin-Madison, Texas A&M, and University of California Berkeley is jointly working on developing physical chemistry curriculum initially for a two-week summer bootcamp on molten salt technology, and ultimately for integration into the curriculum of nuclear engineering departments. This presentation will report on the progress towards developing this curriculum on the physical chemistry of high temperature molten salt solutions.
(No Image Selected)