ABSTRACT
High cost, together with limited reliability and functionality of traditional methods/materials used in energy-water systems, are bottlenecks for advancement in these industries. In addition, thermal-fluid-interfacial interactions are ubiquitous in the energy and water sectors as well as multiple other industries including electronics, oil & gas, and food processing. In this seminar, I will talk about developing inexpensive, widely available, and high performance materials/solutions, compatible with high throughput manufacturing, and on innovative design to increase durability and functionality in order to enhance efficiency and reliability in these industries. In addition, I will show how surface/interface chemistry and morphology can be engineered across multiple length scales ranging from nano to macro for significant efficiency enhancements in a wide range of thermal-fluid processes. First, I will present a new method for developing low-cost thin film polymer coatings via an initiated chemical vapor deposition (iCVD) technique to reduce the adhesion of ice and clathrate hydrates to various industrial surfaces. Formation and accumulation of ice on surfaces can cause severe problems on power lines, solar photovoltaics, offshore oil platforms, and wind turbines. This can decrease efficiency in power production, result in mechanical and/or electrical failure, impact monitoring and control, and generate safety hazards. I will discuss a variety of spectroscopic techniques for mechanical and chemical characterization of the developed polymer coatings. In addition, details on the formation of water immiscible clathrate hydrates inside oil & gas pipelines will be illustrated. I will discuss how developed coatings are very desirable for flow assurance strategies aimed at reducing the occurrence of blockages in the oil and gas pipelines. In addition, I will talk about applications of other engineered surfaces developed by the iCVD method in dropwise condensation and drag reduction for enhancing efficiency in energy generation and consumption as well as in scale prevention for enhancing reliability in water purification. At the end, I will briefly discuss a novel method for micrometer-resolution flexoprinting of electronic materials utilizing interfacial-thermal-fluid engineering and mechanically-robust nanoporous materials.

BIOGRAPHICAL SKETCH
Hossein Sojoudi is a Postdoctoral Associate in the Mechanical Engineering Department at the Massachusetts Institute of Technology (MIT) with a joint appointment in the Chemical Engineering Department. He received his PhD in Mechanical Engineering from the Georgia Institute of Technology in December 2012. Prior to joining Georgia Tech, he was CEO and Founder of a Compressed Natural Gas (CNG) company. He received several awards including the Materials Research Society Best Poster Presentation Award, Prestigious Ann Robinson Clough Grant from Georgia Tech, and several other awards from MIT. Hossein has authored more than 20 papers published in Science, Science Advances, Advanced Energy Materials, and several other scientific journals with over 750 citations. His work has received considerable attention from scientific media such as Science Daily, NewsWise, Science News, and A to Z of Nanotechnology as well as popular media such as Forbes.