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Novel Engineered Surfaces for Energy Applications



ABSTRACT:

Material surfaces play an important role in energy systems, serving as sites for physical processes such as phase change, chemical reactions, electromagnetic and electrochemical interactions, and transport processes. This talk will present novel multiscale texturing that exhibits fractal features as a means of improving the effectiveness of surfaces encountering different physical phenomena. The textures are produced via industrially widely used methods of electrodeposition or chemical etching, rendering the surfaces scalable in size, materials and geometrical complexity for practical applications. Considering power plant condensers, high temperature solar absorbers, molten salt thermal energy storage and heat exchangers as a sampling of energy applications with illustrative surface phenomena, we will journey from the microstructure to the system level technoeconomic considerations to understand the improvements in performance and levelized cost enabled by the engineered surfaces.

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BIOGRAPHY:

Dr. Pitchumani is the George R. Goodson Endowed Chair Professor in the Department of Mechanical Engineering and the Director of the Advanced Materials and Technologies Laboratory (amtl.me.vt.edu) at Virginia Tech. He received the Ph.D. degree in Mechanical Engineering from Carnegie Mellon University, and was with the University of Delaware and the University of Connecticut prior to joining Virginia Tech. Dr. Pitchumani served as the Department Head at the University of Connecticut and as the Associate Department Head for Research at Virginia Tech. From 2011–2015, Dr. Pitchumani served in an invitational role as the Chief Scientist for the SunShot Initiative at the U.S. Department of Energy, where he defined bold national goals for achieving cost-competitive solar energy technologies and their ubiquitous integration into the electric grid. Dr. Pitchumani has also served on the Advisory Board for the Australian Renewable Energy Agency and as the U.S. representative on the Executive Committee of the International Energy Agency. He is the Editor-in-Chief of Solar Energy and serves on the editorial boards of other journals in the areas of energy and materials science. He is the author of 290 scientific articles and is an inventor on 4 patents or disclosures. For his career accomplishments, he was recognized as a Distinguished Alumnus of his alma mater, the Indian Institute of Technology, Bombay. He is a Life Fellow of the ASME and has won many professional awards including the Frank Kreith Energy Award from ASME, and the Charles Greeley Abbot Award and the Hoyt Clark Hottel Award from the American Solar Energy Society.