Published on *UH Cullen College of Engineering* (https://www.egr.uh.edu)

PROFESSOR EARNS U.S. AIR FORCE?S YOUNG INVESTIGATOR AWARD

Posted on January 29, 2016
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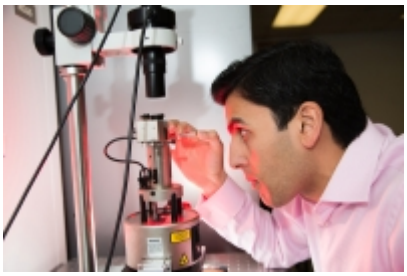

Hadi Ghasemi, assistant professor of mechanical engineering at the UH Cullen College of Engineering, earned the Young Investigator Research Program (YIP) award from the Air Force Office of Scientific Research (AFSOR). He is exploring a bio-inspired thermal management system for high-performance electronic and photonic devices with the $360,000, three-year grant.

The U.S. Air Force program supports young scientists and engineers who show exceptional ability and promise for conducting basic research, according to the AFSOR website.

For the last two decades, researchers have consistently developed smaller and higher functioning electronic and photonic devices. However, increased thermal energy generation that results from miniaturization and enhanced function has become a barrier to further advancement.

Currently, one of the most promising approaches to meet future thermal management demands is thin film evaporation. While the current techniques based on this approach manage space-averaged heat flux, they are not capable of addressing instantaneous local hot spots ? the main cause of electronics and photonics failure. Ghasemi is exploring a new direction for thermal management that addresses both issues.

His bio-inspired smart thermal spreader (BSTS) mimics the elegant approach to thermal management that exists in nature. In the transpiration system of plants, a collection of nano-pores in the leaves called Stoma perform the thin film evaporation by adapting their dimensions as a function of temperature to tune local dissipated heat flux. Ghasemi is studying this natural phenomenon to develop next generation thermal management technology for durable electronic and photonic device performance at safe temperatures.

?The interesting point is that the nano-pores adopt their shapes in a smart fashion based on demand ? they decrease their sizes at high temperatures, while they increase their sizes at low temperatures,? Ghasemi said. ?So they tune heat flux through their leaves as a function of temperature.?

For this project, Ghasemi will use *in situ* scanning probe microscopy to study the fundamentals of thin film evaporation in plants both experimentally and theoretically to guide development of his BSTS and to assess its performance.

?Through these studies, we envision a new way for sophisticated design of thermal management systems to accelerate advancements in high-performance electronic/photonic systems,? Ghasemi said. ?In general, this program will study fundamentals of heat dissipation in natural nano-pores and will implement the lessons in the next generation of smart thermal spreaders.?