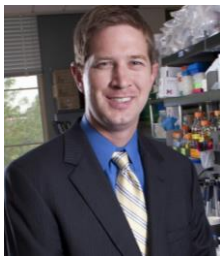
THE UNIVERSITY of EDINBURGH
School of Engineering

IMP seminar

11:00-12:00 on **26th July 2023**

HBB_Classroom 4



Using Radio Frequency Fields for Heating, Curing, Welding, and 3D printing

Prof Micah J. Green （Texas A&M University）

ABSTRACT

Carbon nanomaterials show remarkable heating rates in response to applied radio frequency (RF) fields. We can now show that these responses may be generalized across a wide range of nanomaterial-loaded structures, including carbon nanotubes, carbon nanofibers, and laser-induced graphene. We show using experiments and simulation that the heating rates are correlated with both the geometry and the conductivity of the samples.

The ability to selectively heat using an electric field have wide-ranging implications for manufacturing technologies: (i) Already, this technique has been applied to welding the interfaces of 3D-printed thermoplastic traces together, allowing for additive manufacturing of parts with mechanical properties equivalent to those of their injection-molded counterparts. (ii) RF heating of nano-loaded thermoset systems allows for selective in situ curing of nanocomposite thermoset adhesives in bonded automotive systems without heating the surrounding components. (iii) Rapid RF heating of carbon fiber tows has been demonstrated for out-of-oven manufacturing (and even recycling) of carbon fiber composites for use in the aerospace industry. (iv) RF heating can be used to cure 3D printed thermoset traces during the printing process itself, allowing for new 3D printable ink chemistries.

SPEAKER

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Micah J. Green is a native of West Texas. He studied chemical engineering at Texas Tech (undergraduate), MIT (Ph.D), and Rice University (postdoc). He currently serves as Professor and Associate Department Head in the Artie McFerrin Department of Chemical Engineering at Texas A&M University, where he leads a research group that focuses on nanomaterials and composites processing. He has received the NSF CAREER Award, the Young Investigator Award from the Air Force Office of Scientific Research, and the DuPont Young Faculty Award for his work in these areas.