



## **NECEM SEMINAR: “Laser Annealing of Thin-film Photovoltaics”**

**Dr Elliot Woolley, Loughborough University**

**14:00pm-15:00pm, Thursday 11<sup>th</sup> April 2019**

**A-block room 102A, Ellison Building, Northumbria University**

**Refreshments available after the seminar**

### **Abstract**

“Laser Annealing of Thin-film Photovoltaics”

It seems counter intuitive that the manufacture of photovoltaic panels can be so energy intense, that they need to be installed for a number of years before they generate net energy: A technology, which promises to form part of a bright renewable energy future, holds a dark secret.

CdTe-based thin film solar cells currently represent one of the fastest growing PV technologies. However, the current post-deposition annealing treatment is an energy intensive step of the manufacturing process leading to energy payback times of the order of 2-3 years. Substituting the hot CdCl annealing process for one that utilises flash annealing via laser promises to deliver significant improvements not just in terms of energy, but also product design and manufacturability.

This talk will consider the benefits of laser annealing for thin film processing and describe the use of holographic optical elements (HOEs) for laser beam heat flow control. These HOEs have been designed using COMSOL to create simulations of various laser beam profiles that demonstrate the benefit of laser beam shaping for thin film annealing processes. I will discuss how heat transfer simulations were used to predict the effects of different laser irradiance profiles on the annealing process thermal cycle to influence the experimental design and predict optimal laser irradiance profiles. Specifically I will describe variations in power and process speed on as-deposited and MgCl<sub>2</sub>-treated close-space sublimated (CSS) CdTe samples.

In terms of the manufacturing industry, the implications of laser annealing in PV production will be considered and how this research will now extend to more broadly consider low carbon laser processing as part of a major new UK-China project.



## Biography



Elliot Woolley is a Senior Lecturer in Sustainable Manufacturing within the Wolfson School of Mechanical, Electrical and Manufacturing Engineering at Loughborough University. He obtained an MPhys in Applied Physics in 2003 from the Nottingham Trent University and his PhD in 2007 from the University of Nottingham in the field of atomic physics and nuclear magnetic resonance. He has industrial experience working for an international research and technology organisation where he developed R&D projects for a wide range of innovative small and medium sized manufacturing enterprises.

Elliot joined Loughborough University in 2010 as a post-doctoral researcher and was appointed as a Lecturer in April 2012. He is the University Theme Lead for Resource Efficient Manufacturing. His recent work has focussed on reducing industrial energy consumption through the use of thin-film laser annealing, and through the development of applications for ultraviolet fluorescence sensors.

## Location

A-block room 102A, Ellison Building, Northumbria University

[https://www.northumbria.ac.uk/media/738539/citycampus\\_map.pdf](https://www.northumbria.ac.uk/media/738539/citycampus_map.pdf)

