

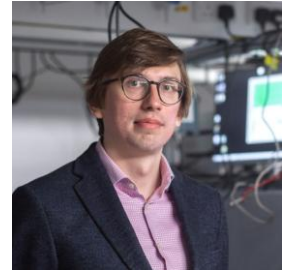


SEMINAR

Time-Resolved Operando Spectroscopy: Observing Charge Generation, Transport, and Trapping in Working Electronic Nanodevices

Date: 11 August, 2026 (Tuesday)
Time: 10:00 a.m.
Venue: Room 7-34 & 7-35, Haking Wong Building
HKU

Speaker: Professor Artem Bakulin
Department of Chemistry and
Centre for Processible Electronics
Imperial College London
U.K.



Abstract:

Further development of modern electronic and optoelectronic (nano)devices requires more than spectroscopic characterization of materials in isolation. Instead, it demands approaches capable of probing materials photophysics *in-device*, under realistic operating conditions, and on the intrinsic temporal and spatial scales of device function.

At Imperial College London, my team develops time-resolved operando spectroscopic techniques that address this challenge by combining optical excitation with electrical readout in working devices. A central element of this approach is the use of infrared optical perturbations to selectively modulate charge populations, enabling direct access to charge generation, localisation, transport, and trapping processes on ultrafast timescales, while preserving full device functionality.

In this talk, I will present an overview of these methodologies, with a focus on processable semiconductor systems, mostly lead-halide perovskite electronic devices. I will show how the developed approaches allow us to disentangle the roles of transport layers, interfaces, and electrically active defects, and to map their impact on device performance.

I will also share our recent efforts extending these concepts to the nanoscale, where short bursts of tunnelling current are used as an ultrafast probe to access charge dynamics in individual nanosystems, opening a route towards ultrafast spectroscopy of single, optically dark nanostructures.

Biography:

Artem received his undergraduate degree in physics from Lomonosov Moscow State University (2005) and PhD from the University of Groningen (2009). In 2010, he was awarded a Rubicon Fellowship from NWO to join University of Cambridge, and in 2012 an NWO Veni fellowship which he carried out at FOM Institute AMOLF in Amsterdam. He came back to Cambridge in 2014 and then moved to Imperial College in 2016 as a Royal Society University Research Fellow. Artem has led ERC Starting (VIBCONTROL) and Consolidator (ACTIONSPEC) grants and was awarded RSC Marlow Award (2018) and Philip Leverhulme Prize (2019). Artem currently leads Ultrafast Optoelectronics group at Imperial (Chemistry) developing optical tools for spectroscopy and control of processible electronic devices.

ALL INTERESTED ARE WELCOME

For further information, please contact Professor Philip Chow at 3917 7905.