PI name & contact details:	**Prof. Cormac McGuinness – Cormac.McGuinness@tcd.ie**
School: ***Has project been agreed with head (or nominee) of proposed registration school?***	**School of Physics** ***yes***
Research Centre / group affiliation:	**School of Physics – X-ray Spectroscopy and Surface and Interface Physics groups**
Research group / centre website:	**http://www.tcd.ie/Physics/People/Cormac.McGuinness/Research/ and http://www.tcd.ie/Physics/Surfaces/**
PI website / link to CV:	**http://www.tcd.ie/Physics/people/Cormac.McGuinness/**

Brief summary of PI research / research group / centre activity (2 or 3 lines max):
The measurement of the electronic structure and magnetic behaviour of single crystal, doped and defect-ridden binary and ternary transition metal oxides, nitrides and fluorides; capped ordered nanowires and organic molecular semiconductor interfaces, all by synchrotron radiation based x-ray emission spectroscopy (XES), x-ray absorption spectroscopy (XAS) and x-ray magnetic circular dichroism (XMCD) at EU synchrotron radiation facilities. These spectroscopies are coupled with both laboratory based x-ray photoemission (XPS), LEED, MOKE, I-V measurements, XRD and STEM as well as computational modelling of the materials within TCD.

Title & brief description of PhD project (suitable for publication on web):

Templating of self assembled organic thin films on plane and stepped surfaces using heteroepitaxial organic molecular semiconductors and/or covalently bonded nanomeshes

Controlled structured growth of organic materials and organic molecular semiconductor thin films remains important for future heterogeneous interfacial devices. The interfaces and local intermolecular forces dominate in determining the structure and, as it turns out, the most useful device characteristics. This project will seek to perform in-situ measurements of the adsorption, chemical bonding and electronic structure of organic molecular semiconductor (OMS) materials forming either heteroepitaxial organic thin films on inorganic semiconductor or metal stepped surfaces, or in the formation of covalently bonded organic nanostructured networks on inorganic semiconductor or metal stepped surfaces. The goal of this project is to make user of this organic-templating effect, where the influence of one OMS material on another OMS material will be quantified through polarisation dependent optical and x-ray spectroscopic measurements, together with surface studies. Experiments will take place in TCD through XPS, LEED, STM, I-V characterisation as well as optical studies of these interfaces and thin films by RAS. These will be augmented by synchrotron radiation based x-ray spectroscopic measurements including NEXAFS, XPS and XES where appropriate. Associated density functional theory calculations of adsorption, electronic structure, and x-ray spectroscopy on these surfaces may play a significant part of this project. This is in collaboration with the group of A. A. Cafolla in Dublin City University.

Unique selling points of PhD project in TCD:
projects should offer something that's not available in Brazil – specific equipment, multi-disciplinarity, aspects of structured programme, links with industry, placements, links with other research groups etc.

The PIs research group routinely access EU based synchrotron radiation sources such as MAXlab in Sweden for our synchrotron radiation based x-ray spectroscopic measurements. The PI has also been a frequent user of

the Advanced Light Source in the Lawrence Berkeley Laboratory in California for many measurements. The facilities within TCD in the X-ray Spectroscopy and Surface and Interface physics groups include UHV growth, LEED, MBE deposition and in-situ XPS and UPS measurements as well as equipment dedicated to in-situ I-V and surface optical measurements. In addition, the CRANN institute has very capable nanoscience and advanced microscopy laboratories which feature state of the art equipment relevant to the preparation and characterisation of nanostructures including STM, AFM, STEM, EELS, FIBs and a He Ion microscope.

The Trinity PhD is a structured PhD and students can access discipline-specific training, as well as generic and transferable skills. All PhD students are eligible to participate in the Innovation Academy which offers a Postgraduate Certificate in Innovation and Entrepreneurship to assist PhD students identify and exploit the value within their research.

Name & contact details for project queries, if different from PI named above:

Please indicate the graduates of which disciplines that should apply:
Physics or Materials Science graduates

Ciência sem Fronteiras / Science Without Borders Priority Area:
Please indicate the specific programme priority area under which the proposed PhD project fits- choose only one (tick box):

Engineering and other technological areas	
Pure and Natural Sciences (e.g. mathematics, physics, chemistry)	
Health and Biomedical Sciences	
Information and Communication Technologies (ICTs)	
Aerospace	
Pharmaceuticals	
Oil, Gas and Coal	
Renewable Energy	
Minerals	
Biotechnology	
Nanotechnology and New Materials	X
Technology of prevention and remediation of natural disasters	
Biodiversity and Bioprospection	
Marine Sciences	
Creative Industry	
New technologies in constructive engineering	