INSTITUTE OF THIN FILMS, SENSORS & IMAGING

The Institute of Thin Films, Sensors & Imaging (TFSI) is a centre of excellence and key laboratory in the UK for the development of functional thin films, deposition processes, as well as characterisation and dissemination of information on thin films applications. TFSI has four main research themes, summarised as follows:

- **Thin film deposition processes** – for optical, engineering, bio-medical and MEMS applications.
- **Sensors** – miniaturised infrared spectrometry based on non-dispersive infrared or photoacoustics.
- **Imaging** – Ultrasonics based on high efficiency piezoelectric thin films. Applications include imaging (medical & dental) and non-destructive testing. Linear variable optical filters for multispectral/ hyperspectral imaging.
- **Gravitational waves (GW)** – deposition of ultralow loss optical thin films for use in GW laser interferometric based detection. Additional applications in high laser damage threshold optical coatings.

The Institute has received extensive funding support from, for example:
Engineering and Physical Sciences Research Council (EPSRC)
Scottish Funding Council (SFC)
Innovate UK
Royal Society
Royal Society of Edinburgh (RSE)
Centre for Sensor and Imaging Systems (CENSIS)
European Union (EU)
Science and Technology Facilities Council (STFC)
Horizon 2020

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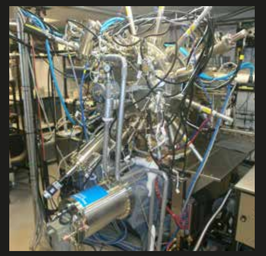



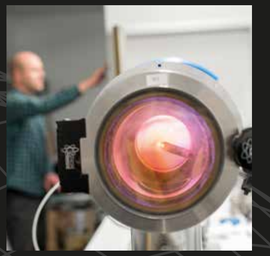

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Institute of Thin Films, Sensors and Imaging

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Thin Film research is by its nature multi-disciplinary. This requires expertise in optical physics, material science and extensive knowledge of deposited film properties. Thin Film Deposition processes require expertise in clean room techniques, vacuum science, plasma physics and chemistry, control theory and experimental design. Characterisation requires expertise in spectroscopy, microscopy, analytical chemistry and surface measurement.

INSTITUTE CAPABILITIES

THIN FILM DEPOSITION TECHNIQUES

- RF and DC magnetron sputtering
- Electron-beam and thermal deposition
- Plasma assisted physical vapour deposition
- Microwave assisted reactive sputtering
- Ion beam sputtering
- Hollow cathode plasma enhanced chemical vapour deposition
- Molecular beam epitaxy

CHARACTERISATION TECHNIQUES

- Scanning electron microscopy
- Atomic force microscopy
- Nomarski optical microscopy
- Electron microscopy & energy dispersive x-ray analysis
- Auger spectroscopy
- UV-Vis-NIR (190nm to 3300nm) spectrophotometry
- IR (2 to 56um) spectrophotometry
- Variable angle spectrophotometry (350nm to 1700nm)
- FTIR spectrophotometry (750nm to 25um)
- Spectroscopic ellipsometry (350 to 1700nm)
- Nano-indenter hardness tester
- Surface energy/contact angle
- Raman microscopy
- Electrochemical analysis
- X-ray diffraction

MODELLING & DESIGN

- Optical design (Zemax)
- Computer aided design (SOLIDWORKS & ProEngineer)
- Essential Macleod, FILMSTAR, TFCALC, Thin Film Design softwares
- Comsol & Ansys physics simulation softwares
- PZFlex: piezoelectric thin film modelling
- Thin film analysis (CODE)

/ Thin Film Deposition
/ Metrology and Characterisation
/ Modelling and Design
/ Applications

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