University of Nottingham
Propulsion Futures

Propulsion Futures Beacon
List of Equipment

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ENERGY DEVICES LABORATORY

Thin Film Analyser

The LINSEIS Thin Film Analyzer is a chip-based platform to simultaneously measure the in-plane electrical and thermal conductivity, the Seebeck coefficient as well as the Hall constant of a thin film sample in the temperature range from -170°C up to 280°C and in a magnetic field of up to 1 T.
Project Lead: Prof. Simon Woodward
Location: B18 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Light Flash Apparatus 467 HyperFlash

The LFA 467 can be used to measure the thermal diffusivity, specific heat and thermal conductivity of metals, graphite, coatings, composites, ceramics, polymers and other materials.
There are two kits of LFA 467 available. The LFA467 Low Temperature has a temperature range from -100°C to 500°C and the LFA467 High Temperature can reach temperatures up to 1250°C.
Project Lead: Dr. Xianghui Hou
Location: B18 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Sloe-Die Coater

Slot-Die Coater can be used to deposit a thin liquid film to the surface of a substrate and offers high levels of coating uniformity across the length/width of the coating surface with thicknesses ranging from a few nanometres to many microns.
Project Lead: Prof. David Amabilino
Location: B18 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Battery Cycling System

The BCS-805 battery cycling system is advanced battery cyclers with a max current of ±150 mA per channel.
Project Lead: Dr. Lee Johnson
Location: A17 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Impedance Analyzer

The Bio-Logic MTZ-35 impedance analyser helps characterise the physical properties and/or chemical interactions of the materials under investigation. The MTZ-35 interface is the Windows-based MT-Lab® software that allows easy management of multiple runs and complex experimental sequences.
Project Lead: Dr. Lee Johnson
Location: A17 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Potentiostat

- SP-300 Biopotentiostat
- CHI 660E
- Gamry Potentiostat

Project Lead: Dr. Lee Johnson
Location: A17 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

K Control Coater

The K Control Coater is widely used for the application of paints, varnishes, adhesives, liquid printing inks and many other surface coatings to produce quick, accurate and repeatable samples. Controlled speed and pressure ensure repeatable results. It is coating by wire wound bars.
Project Lead: Dr. Lee Johnson
Location: A17 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Coin Cell Crimper

MSK-110 is suitable for sealing various types of coin cells such as CR2032, CR2025 and CR2016.
Project Lead: Dr. Lee Johnson
Location: A17 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Compact Tube Roller for Ball Milling and Mixing

The MSK-SFM-TR-2K is a programmable tube roller with a timer setting, which can be used for powder / slurry mixing, ball milling, and rotary coating.
Project Lead: Dr. Lee Johnson
Location: A17 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Vacuum Chamber Bag Sealer

Sontex VMS133 is a large tabletop vacuum chamber with a digital control panel and 1 program memory.
Project Lead: Dr. Lee Johnson
Location: A17 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Glove Box

MBraun Glove boxes under Nitrogen or Argon atmosphere.

- UNIlab plus
- LABmaster pro with vacuum oven
- UNIlab Eco with vacuum oven

Project Lead: Dr. Lee Johnson
Location: A17 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Accurion EP4 Imaging Ellipsometer

The Accurion EP4 Imaging Ellipsometer is used to determine optical properties and thickness of thin films over a spectral range of 1000nm – 200nm and over a range of incident angles between 40 degrees and 70 degrees. What distinguishes this instrument from the spectroscopic ellipsometers in Physics and Pharmacy is the high spatial resolution. With the EP4 the high lateral spatial resolution means that a 10 micron by 10-micron region of interest can be characterized. As well as measuring under ambient conditions, measurements can be made in a temperature-controlled fluid cell. We have two cells, one for reflecting light from the surface and another working with surface plasmons (Kretchmann configuration). The EPS can measure sample properties as a function of time e.g. formation of a self-assembled monolayer on a surface.
We anticipate that this instrument will be useful to research groups working in 2D materials, self-assembled monolayers, polymer solar cells (e.g. looking at the homogeneity of the polymers) as well as patterned devices where the high resolution allows, for example, the thickness of a different layers of a device to be measured. It might even be possible to measure some gently curved surfaces. Further information can be found at https://www.accurion.com/thin-film-characterization-imaging-ellipsometry/nanofilm_ep4
Project Lead: Dr. Christopher Mellor
Location: the electron beam lithography cleanrooms in Nanoscale and Microscale Research Centre (nmRC), Cripps South Building, University Park Campus (no. 53 on map).

ADVANCED MATERIALS LABORATORY

Spark Plasma Sintering System

The Spark Plasma Sintering system will help obtain dense solid samples at greatly reduced temperatures with much shorter sintering periods. A new Molecular Beam Epitaxy e-beam source will allow the growth of boron-nitride semiconductor layers for a wide range of practical applications and an Accurion Elipsometer will support advanced imaging of materials including those for polymer solar PV systems.
Project Lead: Dr. Ming Li and Dr. Fang Xu
Location: A07 in Innovative Technology Research Centre (ITRC), University Park Campus (no. 38 on map).

High-Energy Ball Mill

Fritsch Planetary Micro Mill PULVERISETTE 7 *premium line* is designed for a broad range of applications and ideally suited for loss-free grinding down to a final fineness of 100 nm of hard, medium-hard and brittle materials. Depending on the desired final fineness, the grinding can be performed dry, in suspension or in inert gas. Maximum rotational speed of main disk: 1100rpm. Grinding bowl sizes: 80 ml
Project Lead: Dr. Ming Li
Location: Lab 104 in Wolfson Building, University Park Campus (no. 41 on map).

Cold Isostatic Press

EPSI cold isostatic presses (Model: CIP 400-76*200 Y) efficiently create unsintered die-compacted metal powder parts as a preliminary densification step, before rolling, machining or sintering.
Inside diameter: 76 mm. Inside length: 200 mm. Working pressure (max.): 400 MPa.
Project Lead: Dr. Ming Li
Location: A08 in Innovative Technology Research Centre (ITRC), University Park Campus (no. 38 on map).

Arc Melter

Edmund Bühler GmbH compact Arc Melter MAM-1 is designed for melting samples of approx. 5-20 g up to 3500°C.
Project Lead: Dr. Ming Li
Location: Lab 104 in Wolfson Building, University Park Campus (no. 41 on map).

OTHER EQUIPMENT

Near-ambient pressure X-ray Photoelectron Spectroscopy

NAP-XPS is a UK-leading XPS which allows us to explore the atoms and molecules at the very edge of a material – where all the interactions with the environment take place. The system comprises an ultra-high vacuum (UHV) analysis chamber equipped with a differentially pumped high-pressure hemispherical electron analyzer, a 4-axis sample manipulator and sources for monochromatic micro-focused x-rays, sputtering and charge neutralization. The chamber is also equipped with sources for evaporation and electrospray deposition of molecules. Samples can be introduced through a load-lock onto the UHV manipulator and prepared at pressures down into the 10-10 mbar range. Samples can then be transferred into the in-situ near-ambient pressure (NAP) cell that docks onto the front of the analyzer to perform XPS measurements at pressures up to 20 mbar in a range of gases.
Project Lead and primary contact: Dr. James O'Shea
Location: A15 Research Acceleration and Demonstration (RAD) Building, Jubilee Campus (no. 55 on the map).

Bruker EMX X-band Electron Paramagnetic Resonance (EPR) Spectrometer

For the measurement of the electron paramagnetic resonance spectra of paramagnetic free-radicals and transition metal centres in the solid and solution states at temperatures between 77 and 300 K.
Project Lead: Prof. Jonathan McMaster
Location: B47 Chemistry, University Park (no. 28 on the map).

Plasma-assisted Molecular Beam Epitaxy System for Engineering of Graphene/Boron Nitride Low Dimensional Structures

Hexagonal Boron Nitride (hBN) is a wide band gap (~6eV) semiconductors and is currently used in electronic & UV devices and 2D technology. We will grow BN layers in UHV using high-temperature MBE system. In order to increase the BN growth rate both the flux of N and the flux of B need to be increased. A new generation of highly efficient nitrogen RF-plasma sources already available at Nottingham. However, we also need to increase the flux for boron using alternative types of sources. With the support of Beacon a new e-beam MBE source for Boron is ordered and installed, which will allow a significant increase in the available boron fluxes. Vertical Electron Beam Evaporators (EBVV) allow introducing real e-beam evaporation into many growth systems originally designed for radiation heated effusion cells only.

Project Lead: Prof. Sergei Novikov

Location: B409, Main Physics Building, University Park (no. 22 on the map).