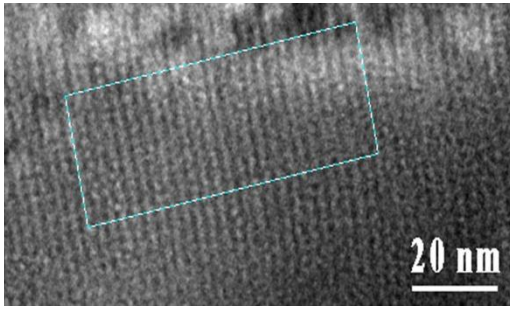
The University Of Sheffield.

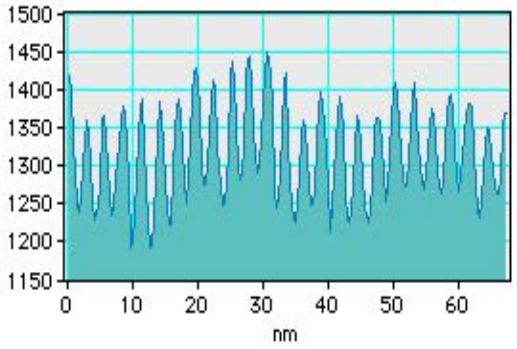
Information on the Research Centre In Surface Engineering for DSTL Meeting 5th Sept. 2012

Prof Allan Matthews

The University Of Sheffield.

Research Centre in Surface Engineering





- Director – Professor Allan Matthews
- Deputy: Dr Adrian Leyland (Senior Lecturer)
  Senior Research Fellow: Dr Aleksey Yerokhin
  PDRAs: Dr Martynas Audronis, Dr Yin Kok, Dr Alison Beck, Dr Heqing Li, Dr John Kavanagh
  +11 PhD students (incl 1 EngDoc) + 1 KTP Associate
- Vacuum Plasma-based surface hardening . (eg of lightweight alloys – aluminium, magnesium, titanium- but possibly applicable to composites)
- Plasma-based coating deposition (Mostly PVD- eg sputter PVD and EB PVD). (Including pulsed plasma technologies (PIII and HIPIMS))
- Non-vacuum Surface treatment processing technologies (eg plasma electrolysis)
- Supertough nanocomposite (inc. nanolayered) coatings

http://www.shef.ac.uk/materials/research/centres/surface

Plasma-based Coating Deposition and Surface Treatment Equipment

- Tecvac triode-plasma electron beam (EB) evaporative PVD
- Tecvac EB plus sputter deposition system
- CVC sputter PVD (powder target)
- Nordiko twin unbalanced opposed sputter PVD
- Plasma Electrolytic deposition
- ANSTO Plasma Immersion Ion Implanter

Coating Test / Evaluation Methods

Pin-on-disc sliding wear / friction test

Reciprocating-sliding wear / friction test

High-cycle impact (ball-on-plate) test

Ball bearing (coated raceway) test

Scratch adhesion (and galling wear) test

Micro-abrasion (ball crater) test

ASTM ‘rubber-wheel’ (dry sand / sand slurry) test

Potentiodynamic & AC impedance spectroscopy corrosion tests

Our current research can be grouped into 4 main themes:

- Nanocomposite Coatings
- Plasma Electrolytic and Vacuum Plasma Thermochemical Processes
- Duplex Treatments and Coatings
- Carbon-based Coatings

The main application emphasis is tribology, and the above coatings and treatments can be used across a range of wear situations, as well as in applications beyond “tribo”-contacts. In fact there are overlaps between the above groups; eg many carbon-based coatings are nanocomposites, and also different processes can be used in hybrid and ‘duplex’ combinations (eg PEO plus a carbon-based coating).

Therefore our applications-related studies tend not stop at just one process or coating; in practice, companies often find our breadth of process know-how in the field to be advantageous, compared to other University groups - which (for example) specialise in, say, just tool coatings (or just high temperature coatings).

Generally, the main benefit is that we are able to respond flexibly - and can adapt - to applications needs and different funding models and mechanisms available (eg TSB Technology Programme and Collaborative R&D projects, Knowledge Transfer Partnerships, EPSRC and FP7 Targeted Calls, etc).

We find also that we can frequently work with several organisations (a “Supply Chain” cluster, for example) in a common theme area - which brings synergistic benefits (and opens up new business opportunities between partners).

The Leonardo Tribology Centre

Leonardo Tribology Centre

- The Leonardo Tribology Centre was developed by the University of Sheffield with funding from Dr H P Jost, the person who coined the word Tribology, as a marketing tool promote its research capabilities to a diverse range of industries.
- The Centre is home to 17 academic tribologists, 20 research associates and 81 PhD students all working on a range of research areas across several disciplines
- Tribology (Friction, lubrication and wear) and surface technology are our core research areas