Kick-off meeting

Barcelona, 3-5 March 2014

UAB
Universitat Autònoma de Barcelona

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University/institution - overview

- *Dublin City University is located in Dublin, capital of Ireland*
- *Dublin has 1.5 M people and Ireland 4.5 M people*
- *Dublin City University currently has 12,500 students in the following Faculties*
  - *Science & Health*
  - *Engineering & Computing*
  - *Business*
  - *Humanities*
- *To date mainly known as a Science and Technology University*
- *Three new humanity related institutions are joing DCU this year – brining student number to 16,500*
- *Uiversirty Partnerships with Royal College of Surgeons and NUIM – 3U Partnership*

Overview

- 21 PIs, 15 PDs and 30 PGs across Mechanical and Electronic Engineering, Physics, Chemistry, Business
- Linked research groups: NCSR, ISSC, NCPST, RINCE; MedEng; BDI
- Main research areas: Production Technologies; Advanced Materials Engineering; Product Design & Sustainability; Micro/Nano Systems Technology

Research activity – Surface Treatments

- Laser glazing of die tool steel for high temperature applications (COST Action 541)

- Laser glazing of biomedical implant alloys for increased wear resistance and biocompatability SS, Ti, CoCr, Mg

- Laser processing of BMG
  – 48Zr45Cu7Al; 48Zr38Cu10Ag4Al

- Composite hard solid lubricant thin films by closed field magnetron sputtering

Research activity – Separation Science

- Total Analysis System (TAS) - microfluidic chip/monolith/sensing design and fabrication

- Multi-Modal Separations – biological and chemical species – nanoalloy tag agents - target isolation, separation, and identification

- Laser ablation – CO_2, Nd:YAG; excimer (XeF)

- Transmission/absorption – shape, roughness, material: glass – quartz, borosilicate, fused silica, soda lime; polymers – PC, PMMA, PDMS, COC

Research activity – Biomaterials

- Hard and soft tissue scaffolds
- Hydroxyapatite and polycaprolactone bone scaffolds
- Polyvinyl alcohol and natural biomacromolecules (such as gelatin) for blood vessel scaffolds
- SLS, 3DP, FDM, Wax pattern generation, electro-spinning

Research activity – Photovoltaics/ICT

- Photovoltaics – texturing for Si quantum dot depositions

- Heat-treatment and characterisation of glass composition to produce a desirable glass-ceramic

- Fabrication of functional, crack-free, multilayer integrated fired ceramics

- High magnetostrictive part fabrication
  Tb–Dy–Fe; $CoFe_2O_4$

Available tools and techniques

- Netzsch Dilatometer
- Stanton Redcroft DTA/TGA
- Micromeritics Helium Pycnometry
- Quantachrome Mercury Porosimetry
- Micromeritics BET Surface Area
- Micro Raman Spectroscopy

- Malvern Particle Size Analyser
- Niro spray dryer/ Screen Printer
- Netzsch attrition milling
- Lenton Horizontal Tube furnace (1600 °C)
- Lenton Muffle Furnance (1600 °C)
- Carbolite RFH Furnace (1600 °C)

Available tools and techniques

- Instron Tension/Compression m/c
- ESH Servo-Hydraulic Fatigue m/c
- Purpose built Torque-Tension m/c
- Micro/Macro Hardness Testers
- Charpy Impact/ Grindosonic Modulus
- FTA 200 angstrom wettability analyser
- High temperature capillary viscometry
- Bulge forming

- Optical Microscopes / Image Analysis and related sample preparation equipment
- SEM (Carl Zeiss LS15) with EDX, BSD, and Cathode luminescence; Alicona software
- Bruker D8 Advance XRD
- Spectrometers – Spectro LES, ICP, AAS, USB650-VIS-NIR Red Tide/ integrating sphere Labsphere 4PGPS040SF
- HVOF/Thermal Plasma Spray/PVD/CVD /Magnetron Sputtering/DLC

Available tools and techniques

- CII Veeco AFM
- Nikon stylus profilometers
- Laser profilometer/ interferometry
- Infinite focus microscope
- Veeco white light interferometer (NT1100)
- Powder compaction/isostatic pressing
- High temperature isostatic pressing
- Ceramic mould preform facilities
- Sintering ovens/Stir casting
- Rapid Prototyping Stratasys FDM, ZCorp 3DP 310, Wax prototyping

Available laser systems

- CO_2 1.5 kW Rofin laser centre
- CO_2 100W
- Excimer ATLEX-200/300i (KrF 248 nm)
- 1.6 J Nd:YAG Newport Quanta Ray
- Nd:YAG 2 and 4 W
- 532 nm (Freq. doubled Nd:YAG) 4 W

Topics for possible collaborations

- **Surface Treatments**
  - **Tooling, biomedical implants, thermal barriers; BMG**
  - **Wear, high temperature, cell viability, ion leaching; nano-particle dispersants – $MoSi_2$, BN, Al, ZrO**
- **Separation Science**
  - **Complex biological species, vitamins, chemicals**
  - **Detection sensitivity, speed, selectivity; Mimics**

Topics for possible collaborations

- **Biomaterials**
  - Surgical devices – blades, drills, ...; implants – hip, knee, stents, keyhole surgery closures, catheter
  - Sharpness, cell viability, wear, composition, thickness, hardness, microstructure

- **Photovoltaics/ICT**
  - Thin film solar cells; textured surface; fired electronic components; HIP of magnetostrictive parts
  - Absorption/transmission, cell efficiencies (solar simulator), micro-raman, non-contact displacement; electrical efficiency I-V curves

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H2020 – Current Calls of Interest

- FoF projects 2, 6, 10, 12
- NMP 5 – 2014; NMP 21 – 2014

Role in the project

- *Case studies of successful stories in nanotechnology*
- *List of jobs and report on possibilities for employment in areas of nanotechnology and advanced materials*
- *Analysis of key players, research & education gaps*
- *Report "Methodologies for transfer of research and innovation in nanotechnology and advanced materials, to education and market“*
- *Preparation of course materials for for vocational courses – especially distance mode*
- *Book editing*
  - *1) Commercialization in nanotechnologies;*
  - *2) Biomaterials in clinical practice today;*
  - *3) Industrial biomaterials;*
  - *4) Biomedical applications of additive manufacturing;*
  - *5) From nano and biomaterials to innovative products;*

Dr Dermot Brabazon

- Micro-Nano Systems Technologies
- Species Separations and Detections
- Laser Processing and Material Forming
- Process Optimisation
- Director of Advanced Processing Technology Research Group
- http://www4.dcu.ie/apt/index.shtml

Recent group night out