



JRC Nanobiotechnology Laboratory

Technical facilities

(January 2018)

Experimental facilities of the Consumer Products Safety Unit include:

- **Physical Chemistry Characterisation lab** for NP synthesis, physical-chemical characterisation and sample preparation
- **Biology lab** for *in vitro* assay development
- **Clean room** facility for micro-nanofabrication and molecular detection.

PHYSICAL CHEMICAL CHARACTERISATION

NP synthesis facilities	TiO ₂ , ZnO, CeO ₂ , Fe _x O _y , SiO ₂ , Ag, Au Np synthesis
Particle Tracing Analyser	Particle sizing
Dynamic light scattering	Particle sizing and/or z-potential analyser
Disk centrifuge sedimentation	Particle sizing
Analytical Ultracentrifuge	Particle sizing
Multi Angle Light Scattering	Particle sizing
Tuneable Resistive Pulse Sensing Particle Sizer	Particle sizing
Centrifugal Flow Field Fractionation	Particle sizing
BET specific surface area determination for powders	Specific surface area characterisation
UV vis spectro-photometer	Nanoparticle and protein characterisation
Asymmetric Field Flow Fractionation	Nanoparticle separation
Circular dichroism	Protein characterisation
HPLC with CAD, UV and Fluorescence detectors	Chemical composition analysis
Inductively coupled Mass spectroscopy	Mass Spectrometer for trace elemental analysis
Total Reflection X-ray Fluorescence Spectrometer (TXRF)	Trace element analysis
Imaging Ellipsometry	Thin film characterisation
Transmission Electron Microscope with EDAX chemical analysis	Electronic Microscopy
Raman confocal microscope	Material characterisation
X-ray Diffractometer for structural analysis (XRD)	Structural analysis
TOF-SIMS surface analysis system	Surface analysis
XPS surface analysis system	Surface analysis

BIOLOGY

Cell culture facilities	In vitro assays (MTT, CFE, LDH...)
DNA Microarray scanner	Microarray reader
Fluorimeter	Fluorescence Spectroscopy Analysis
Cell colony counter	Cell colony counting
Microscope for high content analysis	Imaging system for living cells
Multimode plate reader	Absorbance Fluorescent and luminescence measurements
Flow cytometer	Cell sorting
Real time PCR	Real Time PCR
Impedance Spectrometer	Impedance Spectroscopy system for real-time cell analysis

SURFACE CHEMISTRY, MICRO- NANO FABRICATION, MOLECULAR DETECTION

Micro-contact printer	Protein printing
Micro-spotter	Robot for biomolecule microspotting
Surface Plasmon Resonance Imaging Biosensor	Multiplexed biomolecular real-time detection
Quartz crystal microbalance Biosensor	Biomolecular real-time detection
Portable Surface Plasmon Resonance Imaging Biosensor	Multiplexed biomolecular real-time detection
Surface Plasmon Resonance Biosensor	Biomolecular real-time detection
Microplate Reader	Modulus Microplate / Fluorimeter
Isothermal Titration Calorimeter	Protein characterisation
Fluorescence lifetime spectroscopy	Protein nanoparticle characterisation
Atomic Force Microscope	Surface characterisation
Field Emission Scanning Electron Microscope + Focused-Ion-Beam (FIB) + EDAX + E. Beam writer	Surface characterisation and nanopatterning
Ellipsometer	Thin film characterisation
Electron kinetic analyser	Determination of Z potential of surfaces
Langmuir-Blodgett system	Surface functionalisation
Mask aligner	Photo lithography, Micro patterning of surfaces
Plasma reactor	Plasma etching
Plasma reactor	Plasma polymerisation Acid acrylic/Teflon like
Plasma reactor	Plasma polymerisation PEO
Surface functionalisation	Thiol and Silane chemistries
Magnetron sputtering reactor	Au, Ti, Ag deposition

Further Information on the characterisation:

SURFACE CHARACTERISATION

Instruments	Morphology	Z potential	Elemental composition	Surface chemistry	Coating thickness	Imaging	Crystalline structure
Electro Kinetic analyser		✓					
Electron Microscopy (SEM and TEM with EDAX)	✓		✓		✓	✓	
Ellipsometer					✓	✓	
Raman confocal microscope			✓	✓		✓	
Scanning Probe Microscopy (AFM)	✓					✓	
Standard and Glancing angle (XRD)							✓
Time of flight secondary ion mass spectrometry (TOF-SIMS)			✓	✓	✓	✓	
X-Ray Photoelectron Spectroscopy (XPS)			✓	✓	✓	✓	

NANOPARTICLE CHARACTERISATION

Instruments	Properties											
	Size	Size distribution	Z potential	Specific surface area	Shape	Density	Elemental composition	Surface chemistry	Coating thickness	Concentration	Separation	Chemical composition
Analytical Centrifuge	✓	✓				✓				✓		
Asymmetric Filed flow Fractionator + detectors	✓	✓									✓	
BET Surface Area Analysis				✓								
Centrifugal field flow fractionator + detectors	✓	✓				✓					✓	
Centrifugal Liquid Sedimentation (Disc-centrifuge) (CLS)	✓	✓				✓				✓		
Dynamic Light Scattering (DLS)	✓	✓	✓									
Electron Microscopy (SEM and TEM with EDAX)	✓	✓			✓		✓		✓			
Multi angle light scattering	✓	✓			✓							
Particle Tracking Analysis (PTA)	✓	✓								✓		
Raman confocal microscope							✓					✓
Scanning Probe Microscopy (AFM)	✓	✓			✓							
Time of flight secondary ion mass spectrometry (TOF-SIMS)							✓	✓				✓
X-Ray Photoelectron Spectroscopy (XPS)							✓	✓	✓			✓