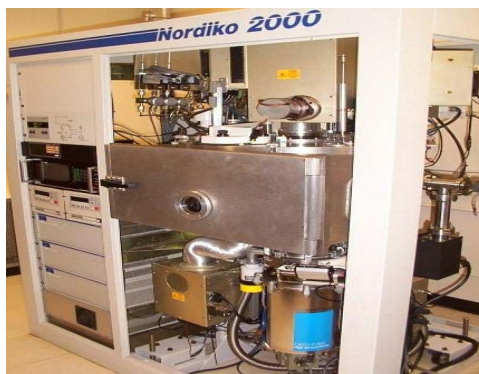


Most AFM modes can work perfectly well in ambient air or even a liquid environment. This makes it possible to study biological macromolecules and living organisms.



**Facilities for Microscopic Analysis**

**School of Engineering Computing & Mathematics**

### **Explorer Atomic Force Microscope**

#### **Scanners**

Scanner	X,Y Range	Z Range
AFM (dry)	2µm	0.8 µm
AFM (dry)	100 µm	8 µm
AFM (liquid)	2 µm	0.8 µm
MFM/EFM	100 µm	8 µm
STM Long range		

## **Supporting facilities**

### **Clean Room**

We have a large clean room which provides a clean environment for sample preparation and houses our sputtering and AFM equipment

### **Nordiko 2000 sputtering machine**

The Nordiko 2000 sputtering system is a fully automated, computer controlled, multi magnetron sputtering machine.

The system has four upwardly facing 15cm diameter circular planar magnetrons. All the targets are water cooled; three of the targets may be supplied with 2kW of DC power and the other with up to 500W of auto-tuning RF power for the sputtering of insulating materials.

The water cooled substrate table can be rotated at various speeds and distances above the targets and may also be RF biased to induce back-sputtering.

The system has three independent gas lines and an adjustable throttle valve backed by a cryo-pump resulting in a wide range of pressures and flow rates being achievable. The machine is fully microprocessor controlled so that codes can be written to produce films on automatic sequence without operator involvement.

All machine settings are internally monitored so that the resultant films are consistently reproduced.



### **Enquiries in the first instance to:**

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**HITACHI S3200N Scanning Electron  
Microscope (SEM) and Oxford Instrument's INCA  
system**

## Introduction

The School of Engineering, Computing and Mathematics at the University of Exeter operates SEM and AFM microscopes for experimental applications at micro and nano scale. Access to our machines comes with the associated expert and technical assistance able to support routine work on a timed basis or contribute to a significant programme of research and testing. Either way, we seek to deliver the results to your specification and at competitive rates.

We offer a full consultation service, from the initial project concept through to final delivery, and will work closely with you to throughout the process. In offering these analytical techniques, together with additional expert services, we aim to be a powerful problem solver for the challenges you are seeking to overcome.

## What are the Applications?

**SEM images can be beneficial to numerous industries, for example the images reproduced in this leaflet enabled Doctors working in the NHS to modify the solutions applied to the eye during surgery. In other completed contracts we were able to identify contaminants on circuit boards for GRAPHIC and on sonic probes for SRA Developments enabling them to redesign their production methods. Becker Coatings use our services to image the surface of their paints to check that their coating processes are satisfactory.**

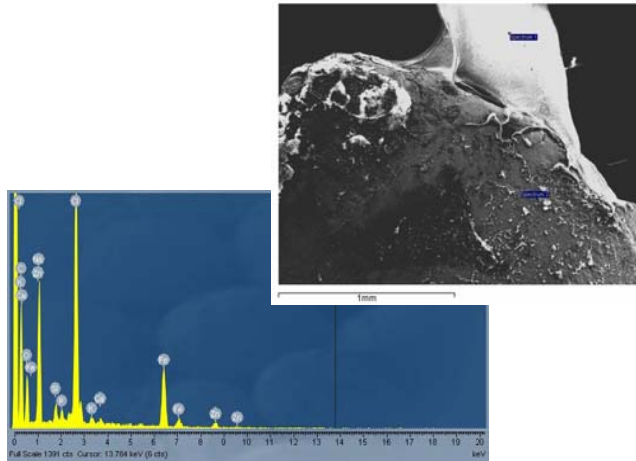
### Potential Future Applications

We are always interested in working with universities and businesses on new and exciting applications using SEM and AFM techniques. Please contact us if you have a project which you feel is suitable.

## Our Microscopes and Support Facilities

### HITACHI S3200N Scanning Electron Microscope (SEM) and Oxford Instrument's INCA system

The HITACHI S3200N has a large specimen chamber, a back scattered electron detector and a variable pressure mode (VP-SEM) This means that the equipment can be operated in either a high vacuum mode (~0.001 Pa) or a low vacuum mode (1 to 270 Pa) allowing the examination of non-conducting samples with no special sample preparation. Combined with an ultra-thin window Energy Dispersive X-ray (EDX) detector for qualitative/ quantitative elemental analysis, Quantitative elemental analysis is also possible

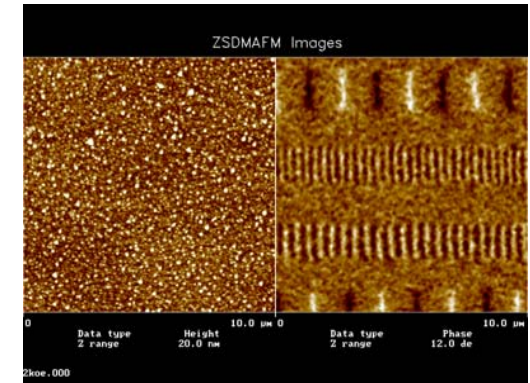


**SEM Image and statistical outputs from our HITACHI S3200N Scanning Electron Microscope - Analysis of a metal shard found in an eye**

The SEM has many advantages over traditional microscopes. It has a large depth of field, which allows more of a specimen to be in focus at one time. It produces stunning images with excellent resolution so closely spaced specimens can be magnified at much higher levels. The magnification range of SEM is ~20 to 250 000X, with a practical operational magnification of ~60 000X.

### Explorer Atomic Force Microscope (AFM)

The Scanning Probe Microscope (SPM) gives three-dimensional analysis of surface properties in the micro and nano metric range. Depending on the principle, the SPM can map topography (AFM and STM), Thermal (sThM), electrical (EFM) and magnetic properties (MFM).



**AFM/MFM particulate PTCO media**

The AFM is a very high-resolution scanning probe microscope, with demonstrated resolution of fractions of a nanometer, more than 1000 times better than the optical diffraction limit. It does not have the depth of field ability of SEM but it provides a true 3D surface profile, and samples viewed by AFM do not require any special treatments (such as metal/carbon coatings) that would irreversibly change or damage the sample.