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SCANNING ELECTRON MICROSCOPE (SEM)

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AUT's investment in the state-of-theart Hitachi SU-70 scanning electron microscope (SEM) benefits both AUT and industry partners.

A SEM is an electron microscope that images a sample by using a beam of high-energy electrons rather than light waves.

The electrons interact with the atoms that make up the sample producing signals that contain information about the sample's surface topography, composition, and other properties such as electrical conductivity.

The Hitachi SU-70 field emission scanning electron microscope is the first of its kind in New Zealand, offering ultra-high resolution imaging (1.0nm/15kV; 1.6nm/1kV), together with magnifications of up to 800,000 times. Advanced imaging capabilities are complemented by analytical options including energy dispersive spectrometry (EDS) and electron backscatter diffraction (EBSD), making the SU-70 an extremely versatile solution for a wide range of applications.

Low electron beam energy options allow for high resolution imaging of fine surface structures and beam sensitive samples. Imaging can be combined with elemental analysis (EDS) to provide information on sample composition utilising both mapping and spot analysis modes.

Through analysing EBSD patterns, unknown phases and micro constituents in materials can be structurally identified.

EBSD can provide information on the crystal orientation and grain boundary misorientations present in crystalline samples, so that mechanical behaviours of materials during processing, testing and during service can be understood.

The SEM is an invaluable research and learning tool not only for the School of Engineering, Computer and Mathematical Sciences, but for staff and students throughout AUT. The School of Science are using the microscope to study marine organisms and cell surface modifications, as well as investigating biofilms to improve processes in the food and dairy industries.

Within engineering, the SEM will facilitate imaging and compositional and structural analysis of microconstituents, to investigate how these affect the mechanical, corrosive and electrical properties of various types of materials.

Information gleaned will enhance the outputs of research projects run in collaboration with industry partners such as Fletcher Ltd, National Aluminium Co, Ullrich Aluminium, Electropar Ltd and NZ Steel.

The SEM is available for use by AUT students and staff, as well as clients from external research organisations and industry. Training and advice on sample preparation procedures and SEM operation is available on request.

> Figure 3- SEM fractograph of Mg alloy.

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Figure 2 - Chemically etched grain boundaries and craters in an aluminium, magnesium and silicon alloy - research aids understanding of the refractive properties of extrusion products for the building industry.

Figure 1a and 1b - SEM investigations of aluminium cast alloys used extensively in the car industry help facilitate understanding as to how microstructures affect strength and fracture toughness.

AZ31B-ObyS 20.0kV 15.1mm x1.00k SE(M) 50.0um