Scanning Electron Microscopy

The machine park at RISE is equipped with the latest technology with respect to Scanning Electron Microscopy (SEM). Thus, we have the possibility to examine in principle all types of materials found in industrial applications.

We offer services within materials characterisation, product, and process development, as well as fault and failure analysis. Using some of the best analysis equipment in combination with our broad knowledge and experience, we perform both consultancy services and advanced research projects for the manufacturing and product development industries, to provide maximum industrial benefit.

CONTACT US

Melina da Silva, Ph.D.
010 – 228 46 96
melina.dasilva@ri.se

Eva Troell, unit manager
010 – 228 48 31
eva.troell@ri.se

Field Emission-SEM (JEOL JSM-7800F)

This Field Emission (FE)-SEM gives unique possibilities to examine all types of materials with very high resolution. By applying a voltage to the specimen, a net voltage (so called landing voltage) of down to 0,01 kV can be obtained, which gives an extremely high sensitivity to fine structures in the material, see examples in figures 1a-d. In addition, we have analysis capabilities with high precision of both qualitative and quantitative Energy Dispersive X-ray Spectroscopy (EDS/EDX) and Electron Backscattered Diffraction (EBSD).

Low Vacuum-SEM (JEOL JSM-6610LV)

This instrument can be operated at high vacuum (for imaging and analysis of conductive materials) or at low vacuum (for non-conducting materials) where the chamber pressure can be varied between 10 Pa and 270 Pa. It is a very robust instrument that can be used to examine all types of materials except liquids, often after no or only very simple specimen preparation. The microscope is equipped with an EDS-detector for elemental analysis.

SEM imaging is performed by detecting electrons that have interacted with the analysed specimen. Secondary electrons (SE) give topographical images (of interest e.g. when analysing fracture surfaces) with high field of focus, and backscattered electrons (BSE) give atomic contrast, where brighter areas have higher average atomic number (density) than darker areas, see figure 2a-b. It is even possible to see different grey shades/contrast in different polymers, when the polymers have different average atomic number. In figure 2b a cross section of polymer fibres is shown, consisting of two different polymers, one in the "centre star" and another in the surrounding "cake pieces".

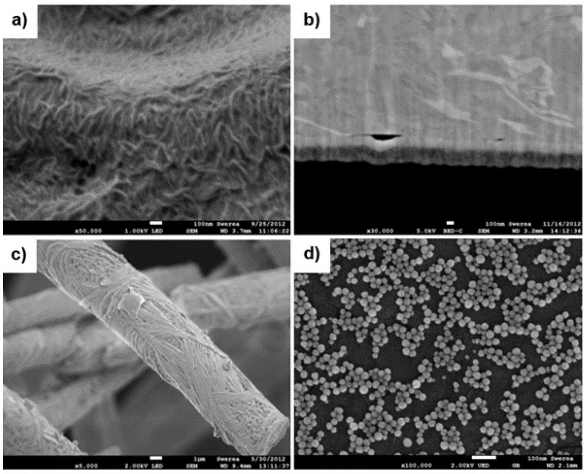

Figure 1: (FE)SEM images
a) surface of transparent polymer film (x50 000)
b) cross section of thin surface layer on titanium substrate (x30 000)
c) ceramic isolation fibre (x5 000)
d) silica nano particles (x100 000)

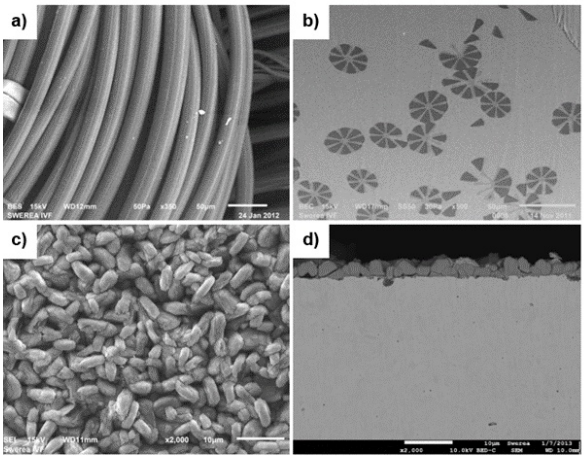

Figure 2: SEM images
a) side view of polymer fibres (x350)
b) cross section of polymer fibres mounted in epoxy (x500)
c) top view of phosphated steel plate (x2 000)
d) cross section of phosphated steel plate (x2 000)

RISE Research Institutes of Sweden
www.ri.se / info@ri.se

Division Materials and production
Manufacturing processes, Argongatan 30, Mölndal