UNDER-STANDING YOUR PRODUCT AT THE NANO SCALE

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PROFESSOR MARK RAINFORTH, DIRECTOR OF THE SORBY NANO INVESTIGATION CENTRE DISCUSSES THE IMPORTANCE OF YOUR PRODUCTS MICROSTRUCTURE.

In the previous article I discussed 'Nanotechnology' and its relevance to business. Today I will discuss the significance of nanotechnology specifically to the materials/metals sector. To refresh our memories, nano is defined as a billionth of metre and even at this scale we can see the structure of the material/metal with advanced microscopy techniques. The information gathered at this level will provide insight into the properties and behaviour of the material and ultimately the performance of the final product. There are several ways to analyse your material at the nano scale. Initially, to analyse the broad structure of the material, such as grain size an optical microscope would reveal this level of detail. However, the higher magnification of the scanning electron microscope is required to visualise many important aspects of the microstructure, such as the substructure, or to analyse test outputs, such as fracture patterns, or surface quality, for example. In addition, the scanning electron microscope can be used to chemically analyse the composition of the material with energy dispersive spectroscopy or work out the crystal orientation of metal grains using electron back scattered diffraction. In conjunction with tensile and torsion testing of the material this type of microscopy can be used to show potential failure points. This is an important consideration in materials development and to ensure the correct material is being used for the product.

History has taught us that microstructure and therefore the choice of the material can be very important. A famous example was the cracking of Liberty cargo ships during World War II. Quickly constructed to replace torpedoed ships, there were many reports of significant and often catastrophic cracking along the hull and deck. It was later revealed that the grade of steel used suffered from embrittlement during service. It was discovered that the brittle fractures occurred when ships in the North Atlantic were exposed to temperatures that could fall below a critical point. The solution was implemented: higher grade steels that could be used at lower temperatures without the risk of failure. The Sorby Nano Investigation Centre possesses the facilities and expertise to analyse the microstructure of material and metals at the optical and scanning electron microscopy level. The data from such analyses would be invaluable to any business developing and improving their product range.

To find out more, please contact us:

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