MICROMERITICS ANALYTICAL SERVICES

The Particle Testing Authority

We're Here To Help!

"These samples are supposed to be the same but they behave differently."

What may seem like minor physical differences between two batches of material can radically affect the behavior of the material. For this reason, we are often asked to identify differences between lots of the same material from the same vendor or between lots of the same material supplied by different vendors. The classification of small particles begins with physical measurements such as particle size distribution, BET surface area, density, and pore-size analysis by either gas adsorption, mercury porosimetry, or both. Often, these tests alone can identify the cause of the problem. At other times, further characterization is needed, such as Microscopy.

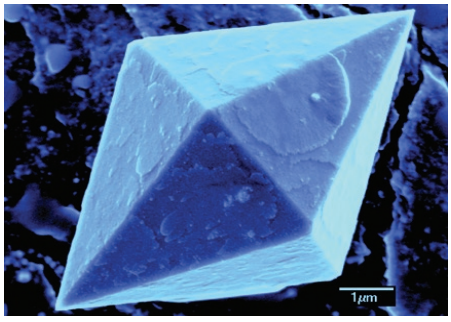
Microscopy

Polarized Light Microscopy (PLM)

The light microscopist immerses the particles in a liquid of known refractive index and records the color and contrast of the particle. Polarized light is used to determine the optical properties of the particle. Many times there are sufficient optical characteristics present to identify the type of particle present.

Scanning Electron Microscopy (SEM)

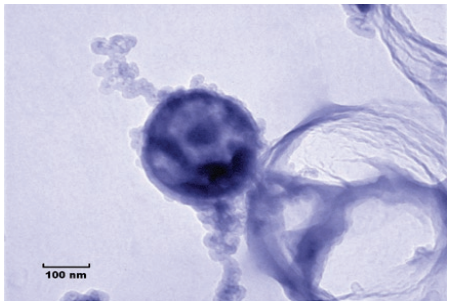
Particles can be imaged and analyzed using electrons instead of light. The images reveal a depth of field and detail that is superior to light microscopy with an added bonus that as electrons are bombarding the sample, x-rays are produced that are representative of the elements present in the sample. Adding an energy dispersive x-ray spectrometer (EDS) enables the microscopist to determine the elements present in the sample while imaging the sample.



Scanning Electron Microscopy photo

Transmission Electron Microscopy (TEM)

Particles too small to be analyzed and imaged by light microscopy or scanning electron microscopy must be observed and analyzed in the transmission electron microscope. For thin samples or samples that can be made thin, TEM imaging techniques can reveal the crystalline structure of the particle as well as its elemental composition (EDS). Clays, pigment particles, thin films, and other nanometer-sized particles can be analyzed and identified in the TEM.



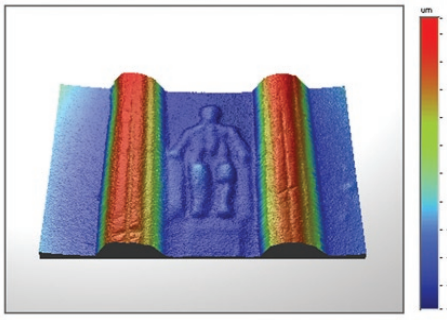
Transmission Electron Microscopy photo

Micro-Fourier Transform Infrared Spectroscopy (FTIR)

Particles that are plastic (easily deformed) can be characterized using a microscope that uses reflected and transmitted infrared light. Polymeric materials that need to be characterized and identified can be prepared for FTIR. The resulting infrared spectrum can be compared to thousands of reference spectra to determine the type of polymer. Manufacturing facilities that occasionally have undesirable particles appear in their finished products will keep a reference library of infrared spectra that identify the materials used in their processes to aid in the characterization of customer returns.

Scanning White Light Interference Microscopy (SWLIM)

The characterization of surfaces requires a slightly different approach using a microscope that can measure surface roughness and provide a three-dimensional image of the surface. This microscope utilizes reflected white light while scanning through focus to create a three-dimensional data set from which surface roughness parameters can be calculated. Unlike stylus profilometry, SWLIM is a non-contact technique with little or no sample preparation required. The example below is the back of an ordinary penny.



Surface Roughness of A Penny

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