Environmental Particle Analysis with IntelliSEM

The Environmental Particle Analysis System (EPAS) is RJ Lee Group’s third generation computer controlled scanning electron microscopy (CCSEM) system for automated environmental particle analysis. EPAS is based on RJ Lee Group’s IntelliSEM software platform and integrates a TESCAN Vega3 SEM (Tungsten source) or Mira3 SEM (field emission source) with a BRUKER Quantax 200 energy dispersive X-ray spectroscopy (EDS) system to enable rapid, automated particle analysis. The EPAS software modules include the Prospector, which controls the operation of the SEM and EDS systems and the Workbench, an advanced post-analysis data review, reporting and management tool. The Prospector takes full control of SEM and EDS instrumentation including performing focus, moving the stage from field to field, directing the electron beam to particle locations, acquiring images of particles (microimages), and collecting EDS spectra, all while monitoring the status of the system as part of quality control. Once acquired, EPAS processes images and spectra automatically to compute size, shape, and elemental composition of each particle.

Example of IntelliSEM EPAS incorporating a Tescan Vega3 SEM with Bruker EDS system. Images and spectra illustrate the ability of the EPAS to distinguish between particles that have similar composition but originate from different sources. The biotite particle is a naturally occurring soil material whereas the fly ash particle is the result of coal combustion in a power plant.

The power of the IntelliSEM EPAS derives from its ability to provide detailed information on the size, morphology and composition of individual particles and to rapidly generate statistical profiles of large particle populations, while retaining detailed information and imagery for each particle. Numerous environmental studies have used EPAS to characterize PM10, PM2.5, PM10-2.5, TSP, nuisance dust, metals in soils, as well as particles originating from point (stack) and fugitive sources. EPAS data has proven invaluable in source apportionment/receptor modeling studies.
The IntelliSEM Prospector Analysis Process

Particle data acquired automatically during the IntelliSEM EPAS analysis of a PM10 sample:
- SEM field image illustrating particle size measurement with perimeter overlays (left)
- Particle microimages and X-ray spectra (right)

The IntelliSEM Workbench

The Workbench is a dedicated offline review and management system that offers a variety of visualization tools combining tabular and graphical representations of analytical data.