

Microscopy and Microprobe Methods in Mexico City: Single Particle Studies.

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Complementary microprobe and microscopy methods can provide detailed information on individual particles. Samples collected during the 2006 MILAGRO study are analyzed using a combination of computer controlled scanning electron microscopy with energy dispersed analysis of X-rays (CCSEM/EDX), high resolution transmission electron microscopy (TEM), time-of-flight secondary ionization mass spectrometry (TOF-SIMS), and scanning transmission X-ray microscopy (STXM) with near edge X-ray absorption fine structure (NEXAFS) spectroscopy. CCSEM/EDX can probe thousands of particles allowing a statistical analysis of particle types. Then STXM/NEXAFS can focus on particular particle types to provide spatial mapping of local chemical bonding information. This type of combination of methods is particularly important for carbonaceous particles where traditional imaging methods yield minimal information on low Z elements such as C, N and O. Current analysis targets the following areas: (a) Evidence of aerosol processing (chemical reaction or physical mixing) at T0 by examining particles before and after sunrise, as well as particles that have traveled from T0 to the T1 site by examining particle composition and morphology (b) characterizing emissions of heavy metals and soot from overnight industrial activities at T0, (c) examining the internal structure and mixing characteristics of sulfur and soot containing particles. Such studies may provide insight into the hygroscopic properties of mixed urban aerosol and susceptibility to wet-removal by washout/rainout, ultimately affecting their atmospheric lifetime.