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CHEMICAL ANALYSIS OF AEROSOLS PARTICLES BY ULTRAVIOLET RESONANCE RAMAN SCATTERING TECHNIQUE

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Amibient aerosols in general do no have any absorption band in the visible spectral region, and present a very formidable task for composition analysis. Meanwhile, it is well known that Raman scattering efficiency is enhanced by resonance absorption. This enhancement effect varies with the absorption strength and the characteristics of the excited states. Therefore the spectral dependence of the resonance enhanced Raman spectroscopic techniques is important and vital in the development of analytical techniques for aerosols or solution droplets of low concentrations. The present work investigates the extent of ultraviolet Raman enhancement under the pre-resonance, resonance and post-resonance conditions, using aqueous solution droplets containing inorganic and organic matters as model aerosols.

The aerosol particles used in this study were generated at 50 kHz by a vibrating orifice. The nominal particle size was 45 μm in diameter. The excitation laser source is Raman shifted output from either the fourth harmonic of a pulsed YAG laser or the YAG pumped dye laser. The combination gives a nearly continuous tunable excitation source between 2000 and 4500Å for the laser Raman scattering experiment. Within the coverage of the laser wavelengths, effects of pre-resonance, resonance and post-resonance Raman scattering on chromates and dichromates were studied in detail. Some preliminary results on the UV enhanced Raman scatterings for the organic aerosols such as napthlene and anthracene will be given as well.