SULFUR BALANCE IN POWER PLANT PLUMES: A CRITICAL REVIEW

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ABSTRACT

Numerous attempts have been made to measure the rate of loss of SO_2 in power plant plumes. If SO_2 decreases more rapidly than an inert pollutant, the control measures necessary to meet SO_2 standards would be eased. More recently, Swedish studies of acid rain, thought to be due to long range transport of sulfuric acid, and U.S. correlations of sulfate loading with health effects, have led to efforts to determine sulfate formation and transport. However, most of the efforts to date indicate very little SO_2 conversion and do not support a significant role for power plant SO_2 in the production of acid precipitation. Careful analysis of these studies, in light of present day knowledge, indicates that they all have serious flaws which render their results useless. An "ideal" plume experiment will be described and the scientific tools, both experimental and theoretical, which are required for the job will be defined. EPA programs to provide these tools will be discussed. The tools include: improved analytical techniques for SO_2, particulate sulfate and particulate mass, aerosol size distribution from which aerosol volume can be calculated, light scattering, microscopic techniques for analysis of airborne particles, dry deposition measurements for SO_2, and development of models to be used in data analysis including meteorological models, homogeneous chemical kinetic models, and heterogeneous chemical kinetic models. A new EPA study of sulfur balance in power plant plumes, project MISTT, Midwest Interstate Sulfur Transport and Transformation, performed by an interdisciplinary group of contractors and university grantees will be described. Preliminary results from this program will be discussed. These results will be interpreted in an explanation of how tall stacks, by increasing the time available for SO_2 to be converted to sulfate before SO_2 is removed by dry deposition, increase sulfate formation, long range transport and acid precipitation.