

Mineralogy, chemistry, and toxicology of particulate emissions from combustion processes

R. GIERÉ^{1,2*}

¹Department of Earth and Environmental Science, University of Pennsylvania, Philadelphia, PA, USA

(*giere@sas.upenn.edu)

²Center of Excellence in Environmental Toxicology, University of Pennsylvania, Philadelphia, PA, USA

Thermal power plants using coal and biomass as fuel represent major sources of coarse, fine, and ultrafine particulate matter (PM) in the atmosphere. The interactions of PM with the atmosphere and the solid Earth, its hydrosphere, and its biosphere, as well as the impacts on human health not only depend on particle number and size but also on other PM properties, including chemical composition, structure, surface area, and solubility of the individual particles, which therefore need to be characterized in detail. Due to the small size of individual airborne particles, they have to be studied with a variety of methods, which include transmission electron microscopy. Similarly, several different tests need to be performed in order to assess the toxicology of such particles, which can easily enter the respiratory tract.

This presentation will give an overview of combustion-derived PM emissions and discuss their various health impacts. The focus will be on the characterization of select types of solid particles, which may be common constituents of emissions from coal and biomass combustion (e.g., metal magnetite, sulfates, chlorides), depending on factors, such as the type of fuel used, the combustion conditions, and the type of pollution-control devices. In addition, the dose-dependent *in-vitro* cytotoxicity, genotoxicity, and tendency to form of reactive oxygen species, as well as the uptake/translocation of these particles in human lung cells (alveolar epithelial A549, bronchial epithelial BEAS-2B) will be discussed.