Aerosol Physics and Chemistry

RTI International is a respected leader in aerosol physics and chemistry, with experience garnered over 40 years of research covering the theoretical and empirical understanding of aerosols across a broad range of sizes, compositions, chemistries, and environments. Our expertise ranges from fundamental, theoretical properties of aerosols to practical applications that solve specific problems for our clients.

RTI applies leading-edge capabilities in aerosol generation, characterization, and mitigation to fundamental and applied research problems for commercial and government clients. Our diverse staff includes aerosol physicists, aerosol chemists, chemical engineers, materials engineers, and organic chemists, many of whom hold advanced degrees. RTI has 6,000 ft^2 of fully instrumented laboratory space dedicated to aerosol physics and chemistry research. Facilities span specialty bench-top equipment to room-size chambers equipped with environmental controls and HEPA filtration that enable us to tightly control experimental conditions. Our capabilities include generating, measuring, characterizing, and collecting particles from 1 nm to larger than 100 µm. RTI's expertise in atomic force and electron microscopy, microelectronic assembly, analytical chemistry, and microbiology facilities can be leveraged to offer clients integrated solutions to complex problems.

Expertise

- Aerosol instrumentation development
- Synthesis of nanomaterials
- Development of filtration media
- Environmental and occupational exposure
- Aerosol environmental fate and transport
- Particle-particle and particle-gas reactions

Areas of Expertise

Aerosol Instrumentation Development. RTI has established expertise in developing novel aerosol instrumentation that has enabled major research programs from applied public health research to fundamental aerosol research. Our expertise has resulted in 16 awarded and pending patents covering novel aerosol filtration media, aerosol exposure monitors, techniques for the chemical characterization of aerosol compositions, and nanoparticle classification methods. We have demonstrated creativity in equipment and method design to assist clients with product development; past successes include development of a proprietary electronic meter dose inhaler and novel fragrance dissemination methods for consumer products.

Synthesis of Nanomaterials. Nanoparticle synthesis research uses chemistry and process engineering capabilities to precisely tune the characteristics of nanoparticles to enable functional benefits. Synthesis capabilities include solution-phase fabrication, thermal evaporation of solids, thermal decomposition of gas precursors, liquid pyrolysis, electrochemical methods, and self-assembly. These techniques allow for production of nanoparticles and materials with a range of properties, including specific particle size/size distributions, composition, purity, morphology, surface area, surface chemistry, and electrical charge to meet a variety of client needs.

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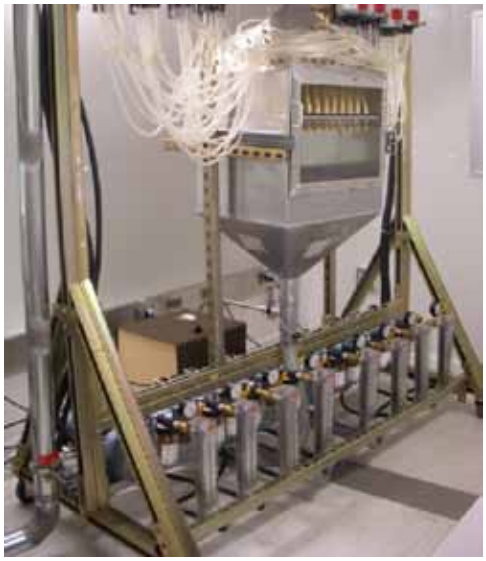

RTI's uniform deposition chamber located inside a multi-purpose, environmentally controlled room.

Development of Filtration Media. RTI's expertise in aerosol filtration theory and nanomaterials fabrication has been leveraged to develop next-generation filtration media made from polymer nanofibers. Our nanofiber-based air filtration technology achieves record performance, demonstrating superior results for collection efficiency per air resistance—translating to cleaner air with less effort. Functionalization of the filter media yields benefits in mechanical strength, chemical resistance, and microbiological viability.

Environmental and Occupational Exposure. RTI researchers apply aerosol physics and chemistry to design, conduct, and interpret environmental exposure and epidemiology studies to identify causal agents linked to specific acute or chronic health outcomes. We develop cutting-edge instrumentation and analytical procedures to provide the high-quality data required to identify the link between pollutant exposure and adverse health outcome. Particulate matter exposure research covers development of sample collection methods, characterization of sources and routes of exposure, development of analytical methods, assessment of pollutant toxicology, and modeling exposure to different types of aerosols.

Aerosol Environmental Fate and Transport. Aerosol transport processes that cause spatial and temporal variability of aerosols in ambient and indoor environments have been a major research area at RTI for the past decade. This comprehensive program covers surface chemistry, coagulation, condensation, deposition, and adhesion processes that affect particles. Results from this research have led to an understanding of personal exposure pathways, the mechanics of particle movement in ambient and building environments, and identification of effective building protection schemes. Specific, unique aspects of this research include spatial-temporal variability of coarse particulate matter, and the application of molecular and physical forces affecting particle adhesion to complex real-world surfaces.

Particle-Particle and Particle-Gas Reactions. Aerosol chemical reactions that have broad applicability to the environmental, public health, and materials communities are a core research focus at RTI. This research extends from exploration of new techniques for aerosol generation to examination of formation and processing of natural and manmade aerosols in our atmosphere. Results from these study areas include development of new aerosol formulations for commercial applications, understanding of the basic chemical changes aerosols undergo during their atmospheric lifetime, and insight into how aerosols ultimately affect the health of the general public.

More Information

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