The **Aerosol Science and Technology** group (Biswas, Axelbaum, Chen, Turner and Husar; as well as their associates at EECE) is funded by several government agencies, such as NSF (NIRT, NER, Education), DOE, NASA, EPA and Industry. The word aerosol is defined as a gaseous suspension of fine solid or liquid particles. As a pioneer in this area, the **Biswas Lab** has developed the flame aerosol reactor to mass-produce nanostructures with controlled sizes and morphologies. Flame-based processes are commonly used in industry to produce large quantities of nanomaterials such as carbon black, paint pigments, and optical fibers. Figure shows an example of making TiO_2 nanostructured films. In a typical experiment, a pre-mixed combustion gases and Ti precursor were used to fabricate films. By controlling the burner-substrate distance, it is possible to fabricate two types of films with controlled morphology and thickness. This system is also capable of generating nanoparticles of TiO_2 with desired crystal phases and sizes by maneuvering the conditions for the flame aerosol reactor. The same group has also formulated a procedure for evaluating the toxicity of TiO_2, in an effort to establish fundamental metrics based on property-biological effect relationships that will lead to guidelines for environmental health and safety. Based on fact that the production of reactive oxygen species (ROS) does relate to the toxicity of nanoparticles, the level of ROS generated was evaluated using a fluorescence dye and expressed as equivalent concentration of peroxide. In the presence of ROS or peroxide, a fluorescence dye can be oxidatively modified into a highly fluorescent derivative which can be detected using a spectrofluorometer. These findings indicate that ROS is highly dependent on the physicochemical properties of TiO_2 nanoparticles, such as size, surface area, and crystal phase. To further develop a range of nanomaterials for toxicity evaluation, the Biswas group is exploring the detailed understanding of aerosol dynamics and designing new reactors for making nanomaterials of various kinds. This effort will establish the fundamental metrics based on property-biological effect relationships that can serve as guidelines for environmental health and safety

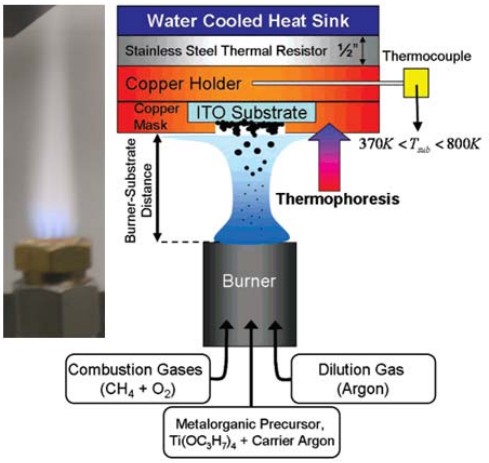

Figure. A schematic diagram of an aerosol flame reactor for making TiO_2 nanostructures.

Jiang, J., Chen, D. R. & Biswas, P. Synthesis of nanoparticles in a flame aerosol reactor (FLAM) with independent and strict control of their size, crystal phase and morphology. *Nanotechnology* **18**, 285-290 (2007)

Biswas Lab: http://www.aerosols.wustl.edu/~pbiswas/