

**TITLE: Developing Supersonic Impactor and Aerodynamic Lens
for Separation and Handling of Nano-Sized particles**

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PERIOD OF

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ABSTRACT

OBJECTIVES

The general objective of this project is to provide the needed fundamental understanding of supersonic/hypersonic impactors as well as aerodynamic lenses for nano-particle separation and focusing. The specific objectives are:

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- To develop a design for supersonic/hypersonic impactor for nano-particle separation.
- Develop a design for aerodynamic lenses for generating focused beams of nano-particles.
- Perform a series of computational fluid dynamic (CFD) simulations of supersonic/hypersonic impactor and aerodynamic lenses for performance analysis and design optimization.
- Develop a scientific knowledge basis for supersonic/hypersonic impactors and for aerodynamic lenses.

ACCOMPLISHMENTS TO DATE

Literature survey on the recent works on supersonic and hypersonic impactors as well as aerodynamic lenses was performed. Progress was made in developing a computational model for supersonic flows of compressible gases at low pressures in various passages.

SIGNIFICANCE TO FOSSIL ENERGY PROGRAM

Developing effective supersonic/hypersonic impactors for nano-particle separation is of considerable interest for production of efficient catalysts for co-production of synthetic fuel and electric power in connection the FutureGen clean coal energy initiative. Also developing aerodynamic lenses for generating focused beams of nano-particles are critical to characterization of these materials.

FUTURE WORK

The plan for the deliverables for the Phase I project are:

- § A design for an effective supersonic/hypersonic impactor for nano-particle separation.
- § A design for an efficient aerodynamic lens nano-particle focusing.
- § Computer simulation for various operation conditions of supersonic/hypersonic impactor for nano-particle separation.
- § Computer simulation for various operation conditions of aerodynamic lens for nano-particle focusing.

ARTICLES, PRESENTATIONS AND STUDENT SUPPORT

Journals Articles (peer reviewed)

Abouali, O. and Ahmadi, G., A Model for Supersonic and Hypersonic Impactor, J. Nanoparticle Research, Vol. 7, pp. 75-94 (2005).

Conference Presentations

R.S. Chavali, and G. Ahmadi, "Particle Focusing At Atmospheric Pressures," 24th Annual Conference of the American Association for Aerosol Research, AAAR 2005, Austin, TX, October 17-21, 2005.

R.S. Chavali, G. Ahmadi, and S. Dhaniyala, "Particle Focusing Using Aerodynamic Lens with Slits," 24th Annual Conference of the American Association for Aerosol Research, AAAR 2005, Austin, TX, October 17-21, 2005.

Students

- § R.S. Chavali, (MS) student, Mech. & Aero. Engineering, Clarkson University