Precise, Rapid and Scalable Size Selection of Nanoparticle Populations

Overview: Auburn University seeks licensees for a method for the precise and rapid size selection of nanoparticles from a polydisperse population. When compared to existing processes, Auburn’s CO₂-based process is faster, less expensive, cleaner, more precise, tunable and scalable. This technology has potential applications throughout the nanotechnology industry, including optics and medical imaging.

Advantages:
- **REDUCED TIME** - Significantly reduces time needed for a size fractionation compared to centrifugation, with reduced post-processing time through simple CO₂-based cleaning
- **COST EFFECTIVE** - Reduces expense and increases throughput (as compared to chromatographic methods)
- **BETTER OUTPUT** - Narrow particle distributions as compared with existing methods
- **TUNABLE** - Allows for mean particle size and polydispersity to be predetermined by simply choosing the proper CO₂ pressurization.
- **GREENER** - Reduces environmental impact through use of CO₂ as the antisolvent and resultant simple solvent recycle

Description: This method for precise, rapid and improved separation of nanoparticles by size relies on a solvent/antisolvent method that uses a gaseous antisolvent (e.g., CO₂) to create a tunable gas expanded liquid. Pressurized gaseous CO₂ is placed over a nanoparticle solution. By changing the pressure of CO₂, the resulting fraction of liquid CO₂ in the solution can be increased or decreased. Given that particle dispersibility is a function of CO₂ concentration in the liquid, particles of any given target size can be made to precipitate by simply manipulating the CO₂ pressure. Multiple monodisperse particle populations can be rapidly fractionated by adjusting only the CO₂ pressure and the liquid location, thereby eliminating the difficulties associated with other methods that are time and solvent intensive, expensive and/or have limited throughput.

Status:
- Two issued US Patents: 8,215,489 and 8,377,831
- This invention has been successfully verified by laboratory experiment with various ligand-coated metallic and semiconductor nanoparticles
- A scale prototype system has been created and tested (see figure)
- Either or both of these patents are available for immediate non-exclusive licensing through Auburn’s customizable “Ready to Sign” licensing program.
- Similar patents available for Nanoparticle Technologies, including a companion technology that uses a similar methodology to deposit nanoparticles as dense films with more uniformity, less processing and less cost than existing methods.