SAMUEL GINN COLLEGE OF ENGINEERING

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Precise, Rapid and Scalable Size Selection of Nanoparticle Populations

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Reference: Size Selection

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Reference

McLeod, M. C.; Anand, M.; Kitchens, C. L.; Roberts, C. B. *Nano Lett.*; **(Letter)**; **2005**; 5(3); 461-465. (pdf)

Licensing

This technology is available for exclusive or non-exclusive licensing

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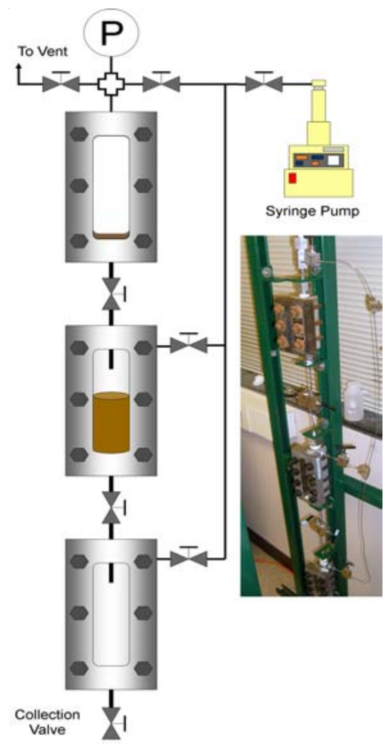
Overview

Auburn University seeks a licensee for a method for the precise and rapid size selection of nanoparticles from a polydisperse population. When compared to existing processes, Auburn's CO_2-based process is faster, less expensive, cleaner, more precise, tunable and scalable. This technology has potential applications throughout the nanotechnology industry, including optics and imaging.

Advantages



- Significantly reduces time needed for a size fractionation compared to centrifugation
- Reduces expense and increases throughput (as compared to chromatographic methods)
- Narrows particle distributions as compared with existing methods
- Allows for mean particle size and polydispersity to be predetermined by simply choosing the proper CO_2 pressurization
- Reduces operating costs and environmental impact through use of CO_2 as the antisolvent
- Reduces post-processing time and costs through use of CO_2, allowing simple particle cleaning and solvent/antisolvent recycling
- Allows easy and precise separation of various nanostructures, including nanorods or quantum dots

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., CO_2) to create a tunable gas-expanded liquid. Pressurized gaseous CO_2 is placed over a nanoparticle solution. By changing the pressure of CO_2, the resulting fraction of liquid CO_2 in the solution can be increased or decreased. Given that particle dispersibility is a function of CO_2 concentration in the liquid, particles of any given target size can be made to precipitate by simply manipulating the CO_2 pressure. Multiple monodisperse particle populations can be rapidly fractionated by adjusting only the CO_2 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

- A companion technology exists that uses a similar methodology to deposit nanoparticles as dense films with more uniformity, less processing and less cost than existing methods
- US (20070243716) and EU applications have been filed; additional non-provisional filings are anticipated
- This invention have been successfully verified by laboratory experiment with various ligand-coated metallic and semiconductor nanoparticles
- A scalable prototype system has been created and tested (see figure)