Auburn University

Innovation Advancement & Commercialization

Production of Dense and Uniform Nanoparticle Films

Contact

Brian Wright
Auburn University
Innovation Advancement
& Commercialization
334-844-4977
brian.wright@auburn.edu
https://iac.auburn.edu/
Reference: Nanoparticle Films

Inventors

Dr. Chris Roberts
Dean
Ginn College of Engineering

Dr. Chandler McLeod
Ph.D. Graduate
Dept. of Chemical Engineering

Dr. Madhu Anand
Ph.D. Graduate
Dept. of Chemical Engineering

Status

- This invention has been successfully verified by laboratory experiment with various ligand-coated metallic nanoparticles.

Click here for a listing of Auburn patents available for immediate licensing

Click here for a listing of Auburn's available physical science technologies

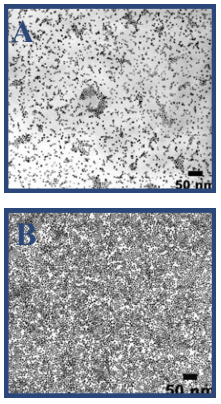
Follow Auburn IAC

Overview

Auburn University is seeking licensees for a technique to create highly uniform and dense nanoparticle films. This novel technique utilizes CO_2 as an antisolvent and allows for controlled deposition of particles, resulting in more consistent nanoparticle thin films with fewer defects than films made using standard solvent evaporation techniques. This technology has applications in optical devices, sensors, catalysis and semiconductors.

Advantages

- Deposits dense, uniform, nanoparticle films on surfaces via simple solvent/anti-solvent interactions
- Allows for recovery of intact films by eliminating standard solvent evaporation steps that typically disrupt films in post-processing
- Allows for control of film density, quality, spacing and ordering by manipulating such parameters as particle size, particle polydispersity and system pressure
- Uses moderate temperatures, allowing for film deposition on materials incompatible with CVD
- Reduces operating costs and environmental impact through use of CO_2 as the anti-solvent
- Reduces post-processing time and cost via simple and effective particle cleaning and solvent recovery



Electron micrographs of particle films:
(A) Solvent evaporation
(B) Auburn process

Description

A major thrust of research is currently focused on post-synthesis nanoparticle manipulation for application in such fields as catalysis, optical systems, electronic devices, and sensors. Full utilization of nanoparticles for these applications requires the ability to effectively process and maneuver particles onto surfaces. Such deposition is typically performed by evaporating a liquid solvent containing dispersed nanoparticles. This method, however, can give rise to undesirable features in the film due to surface tensions in the liquid/vapor interface that moves across the surface during evaporation.

In Auburn's novel process, CO_2 is introduced into the system to form a gas-expanded liquid that results in nanoparticle precipitation and deposition. Additional CO_2 is then pumped into the system until the original solvent is removed, at which point the pressure is lowered to release the CO_2 without causing the typical defects caused by evaporation. This method is simple, efficient, allows for easy solvent recycle, and leaves no residual liquid solvent.

Licensing Opportunities

- US Patent 7,384,879
- This patent is available for immediate nonexclusive licensing through Auburn's customizable "Ready to Sign" licensing program.
- Similar patents available for Nanoparticle Technologies, including a companion technology that fractionates nanoparticles by size with less time and cost than existing methods

AUBURN UNIVERSITY