

PATENT: 11,358,112

Ultrasonic Powder Dispersion Enables Stable, High-Concentration Aerosol Generation

Fine, cohesive powders are difficult to aerosolize because micro- and nanoparticles cling to one another and to equipment surfaces. Conventional feeders can clog, cake, or lose output over time, limiting reliable delivery in medical, research, and manufacturing settings.

This patented platform applies ultrasonic energy to create standing pressure waves that lift powder from a feed surface into a dense, suspended cloud. The aerosol can then be entrained in a gas stream and, when needed, routed through a venturi-based de-agglomeration stage. By reducing physical contact before collection, the system limits buildup and supports stable generation of high-concentration aerosols over extended periods.

APPLICATIONS

- High-dose pulmonary drug delivery, including antibiotics and other respiratory therapeutics
- Inhalation toxicology, dosimetry, and exposure studies
- Continuous pharmaceutical powder processing and manufacturing
- Aerosol feedstock for plasma, thermal, and cold-spray coating processes
- Additive manufacturing and advanced-materials processing
- Standardized aerosols for calibration of particle-measurement instruments
- Environmental and agricultural aerosol research, including pollutants and soil dust

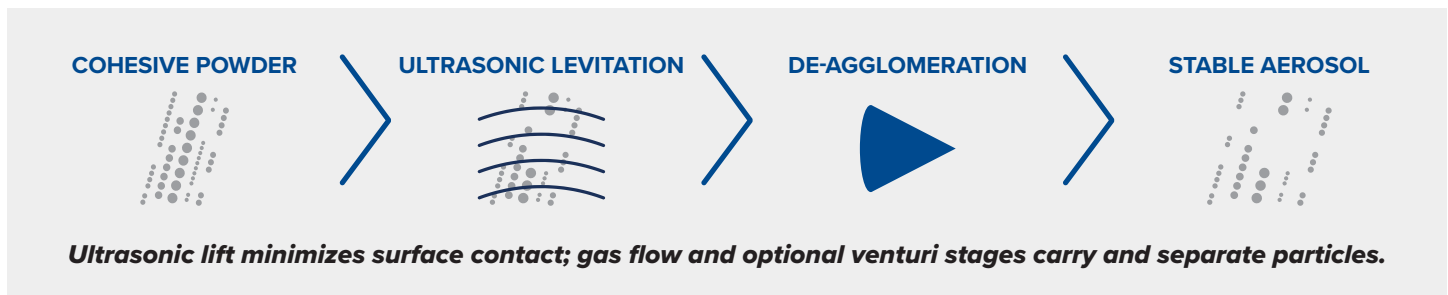
VALIDATION HIGHLIGHTS

Patent examples report stable aerosol production from polyimide and titanium-dioxide powders, with collected particles showing substantially less agglomeration than native powders. The disclosed platform supports sustained generation for one hour or more, with some configurations extending to several hours.

ABOUT THE OFFICE OF TECHNOLOGY TRANSFER

Research and innovation are rewarding, but it is the application of those ideas that truly brings them to life. The Office of Technology Transfer (OTT), housed within the FedEx Institute of Technology, guides innovations from big ideas to licensed intellectual property and breakthrough commercial products. To explore licensing and collaboration opportunities, contact the University of Memphis OTT.

FROM COHESIVE POWDER TO CONTROLLED AEROSOL



ADVANTAGES

- Stable, continuous aerosol generation from cohesive micro- and nanopowders
- Reduced clogging and caking by lifting powder before it contacts downstream moving parts
- Solvent-free, room-temperature operation can preserve powder purity and crystalline structure
- Supports fine particles in the approximately 0.1–10 micrometer range
- Scalable output through multiple ultrasonic transducers and configurable feed geometry
- Portable, comparatively simple architecture adaptable to existing powder-dispersion equipment

TECHNOLOGY

An ultrasonic transducer is positioned above a powder-bearing surface. At resonance, pressure waves form a standing-wave field that overcomes particle-to-surface adhesion and creates a suspended dust cloud. A sampling or outlet flow removes the cloud, while a venturi stage can provide turbulent energy for further de-agglomeration.

Embodiments include rotating grooved discs, one or more powder feeders, multiple transducers, gas inlets, and enclosed aerosol outlets. The architecture can also be implemented as an adapter for an off-the-shelf disperser.

INVENTORS

LEAD INVENTOR



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Dr. Gopalakrishnan's research focuses on gas-phase transport, aerosol science, high-concentration ultrasonic powder dispersion, and aerosol-based materials processing.

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