AIChE

Technical Program Menu

[294h] - Measuring the Agglomerate State of Dry Powder Aerosols for Pulmonary Drug Delivery

Presented at: [294] - Fluid Particle Interactions in the Pharmaceutical Industry

For schedule information click here

Author Information:

Willard R Foss *(speaker)*
Inhale Therapeutic Systems
150 Industrial Rd
San Carlos, CA 94070
Phone: 650-631-3309
Fax: 650-631-3150
Email: wfoss@inhale.com

Abstract:

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Measuring the agglomerate state of dry powder aerosols for pulmonary drug delivery

Authors: Willard R. Foss, Mark Postich, Reinhard Vehring and Nazli Egilmez, Advanced Technology, Inhale Therapeutic Systems, 150 Industrial Rd., San Carlos, CA 94070

Pulmonary delivery of pharmaceuticals by dry powder inhalers (DPIs) requires the dispersion of micron-sized particles with the energy provided by inhalation. For effective dosing, a significant and repeatable fraction of the resulting aerosol cloud must be comprised of particles with aerodynamic diameters less than 3.3 mm. Identifying the particle properties that lead to low inter-particle cohesion and effective dispersion assists in the development of efficient and high-performance products.

An instrument has been developed that measures the agglomerate state of dry powders to assess the degree of agglomeration of powders dispersed at energies typical of a patient inhaling through a DPI. Partially agglomerated aerosol clouds are generated under controlled conditions with a variable energy disperser. The aerosol is held in a

vessel designed to minimize losses. Individual agglomerates are sampled from the vessel and analyzed for the number of particles and their aerodynamic sizes. The number of primary particles in each agglomerate is counted by dispersing the aerosol in a sonic nozzle and detecting the resulting cluster of particles downstream of the nozzle with a laser light sheet. Large numbers of agglomerates are analyzed to return reproducible histograms of the agglomerate state of the aerosol. The aerodynamic size is determined by a time-of-flight technique.

Agglomerate histograms of several pharmaceutically relevant powders will be presented where powders consisting of particles of various sizes, morphologies, densities and compositions will be examined. The cohesive force between micron-sized particles with well-characterized properties will also be analyzed by examining the aerodynamic force required to deagglomerate aggregates of model particles.

Contact Information: **Meetings Department**
American Institute of Chemical Engineers
3 Park Ave, New York, N.Y., 10016-5991, U.S.A.
Tel: (212) 591-7338 Fax: (212) 591-8894
E-mail: meetmail@aiche.org