ELECTROSPRAY AEROSOL GENERATOR MODEL 3480

PRODUCES PARTICLES AS SMALL AS 3 NM IN DIAMETER, IN CONCENTRATIONS AS HIGH AS 10^7 PARTICLES/CM^3

The Electrospray Aerosol Generator (EAG) produces high concentrations of monodisperse, submicrometer particles from 2 to 100 nm (initial droplet diameter of 150 nm, nominal). The Electrospray pushes a charged liquid solution or suspension through a capillary tube and exerts an electrical field on the liquid at the capillary tip. The electrical field pulls the liquid from the capillary, forming individual droplets. Air and CO_2 mixed with the droplets evaporate the liquid and the remaining particles are neutralized by an ionizer.

Applications

The successful use of the electrospray method to generate monodisperse aerosol has been documented in many publications. Although the basic principles are well understood, many of the fine details explaining how different operating parameters affect the electrospray method remain to be discovered. Known applications for this instrument include:

+ Instrument calibration
+ Nano-aerosol studies
+ Macromolecular and submicrometer aerosol analysis
+ Nanometer-sized powder dispersion

Features and Benefits

+ Generates particles from 2 to 100 nm in diameter
+ Particles are uniform in size and shape

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SPECIFICATIONS

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Settings and Requirments

Particle generation rate	>10^7 particles/cm^3
Liquid conductivity	0.2 S/m nominal
Liquid flow rate	50 to 100 nL/min
Particle size range	<3 to >100 nm
Initial droplet diameter	150 nm
Differential pressure	0 to 5 psi (3.0 psi nominal)
Air flow	0.2 to 2.5 L/min (1 L/min nominal)
CO_2 flow	0.05 to 0.5 L/min (0.1 L/min nominal)

Power Specifications

Charger	Po-210, 5 millicurie*
Voltage range	+0.5 to +3.5 kV (2 kV nominal, negative high-voltage module available)
Current range	0 to 2000 nA (180 to 320 nA nominal)
Power requirements	85 to 264 VAC, 50 to 60 Hz, 25 W maximum

Product Specifications

Dimensions	20.3 x 40.4 x 25.7 cm (8.0 x 15.9 x 10.1 in.)
Weight:	6.8 kg (15 lb)

Operation

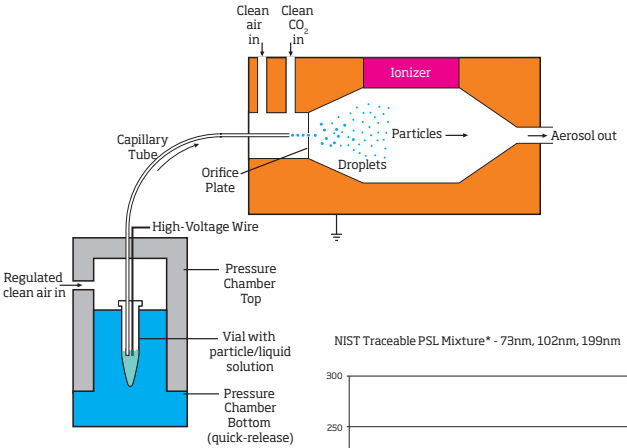
The operator places a standard centrifuge vial containing a sample solution inside a cylindrical pressure vessel. The vessel accommodates a capillary and a high-voltage platinum wire, both of which are immersed in the solution. Maintaining a differential pressure moves the solution through the capillary. An electric field induces a charge on the solution at the capillary tip and acts on the induced charge to form ultrafine droplets that are mixed with clean air and CO_2. The gas flow transports the droplets to the neutralization chamber. The highly charged droplets are neutralized by a radioactive source (Polonium 210), and the liquid evaporates before the aerosol exits the instrument.

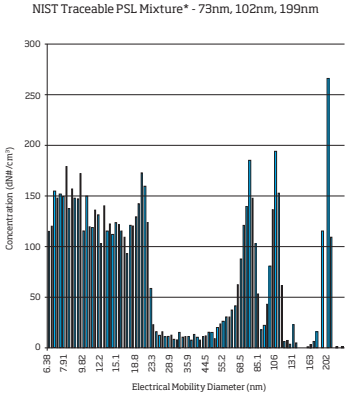
Particle Type

Aerosol particles as residues from electrosprayed solutions:

Water-soluble, nonvolatile solids and liquids may be used to generate residue particles with diameters from less than 3 to about 50 nm. Using this approach, every spray droplet dries to a residue particle that contributes to the final aerosol, resulting in the highest aerosol concentrations obtainable from the Model 3480. The size distribution of the final aerosol reflects that of the primary droplet distribution and is, thus, a property of the Model 3480.

Aerosol particles from aqueous suspensions and emulsions: Aerosols of nonsoluble particles, lipid droplets, or macromolecules are obtained by spraying the corresponding dilute suspensions or emulsions. Proteins as small as 3 nm and PSL particles as large as 200 nm (that is, somewhat larger than the spray droplets) have been aerosolized successfully in this way. Dilution ensures that most droplets contain no more than a single particle. The size distribution reflects that of the suspended particles or macromolecules, and the concentration achieved is not as high as in the solution-residue method.





Specifications are subject to change without notice.

*Neutralizers are shipped separately. End-user name and address required.
†Emulsifier present below 25 nm.

Model 3480 is covered under U.S. Patent Numbers 5,076,097 and 5,247,842.

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P/N 1930098 Rev C
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