

Nanoparticle Nebulizer Model 9110

The Nanoparticle Nebulizer Model 9110 is a new nebulizer that produces droplets with a peak diameter $<1 \mu\text{m}$ in diameter. Developed by Kanomax, in association with CT Associates, Inc. (CTA), the Nanoparticle Nebulizer offers the following advantages over existing nebulizer technology:

- Limits the influence of non-volatile residue on nebulized particles.
- High sample flow rate.
- Small droplet sizes reduce the potential for particle agglomerates after drying.
- Continuous on-line flow rate to the nebulizer.
- Ability to inject a small sample directly into the nebulizer.
- Does not require a conductive solution (unlike electrospray nebulization).
- Integrated heated evaporator.
- Continuous monitoring nebulizer sample flow rate
- Temperature and pressure logging of on-line sample flow rate.
- Feedback control of evaporator and nebulizer housing temperatures.
- Can be used as a nebulizer for the Liquid Nanoparticle Sizer (LNS) system.
- Color touch screen with a graphical interface displaying nebulizer status.

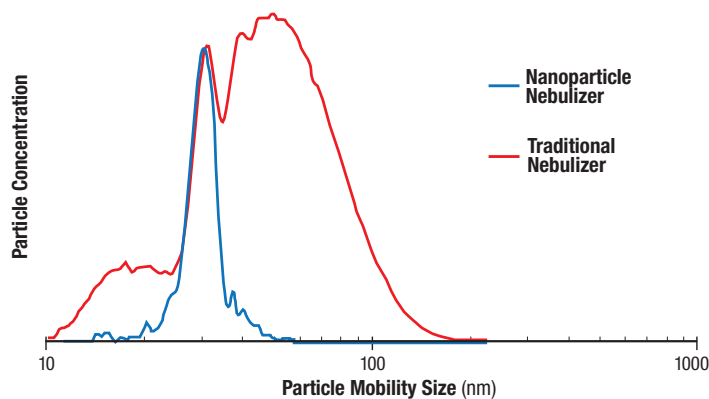


Figure 1: Comparison of 30 nm Colloidal Silica using a traditional atomizer (nebulizer) and the Nanoparticle Nebulizer (Taken from a paper presented at the Pittcon Conference and Expo, March 15, 2012).



How It Works

Using a traditional nebulizer to create an aerosol of colloidal particles often results in interference from any non volatile residue present in the sample. After droplet evaporation, non volatile residue creates particles of residue regardless of whether the droplets contain colloidal particles or not. When there is a particle in a droplet, non-volatile residue forms a coating on the particle. This coating is problematic when you aerosolize small particles ($<30 \text{ nm}$) or those where the surface properties are of concern (such as in toxicology studies) because it changes the surface properties of the particles. The Nanoparticle Nebulizer mitigates nonvolatile coating by minimizing the size of the nebulized droplet, thereby reducing the influence of non-volatile residue on the final aerosol properties (shown in Figure 2).

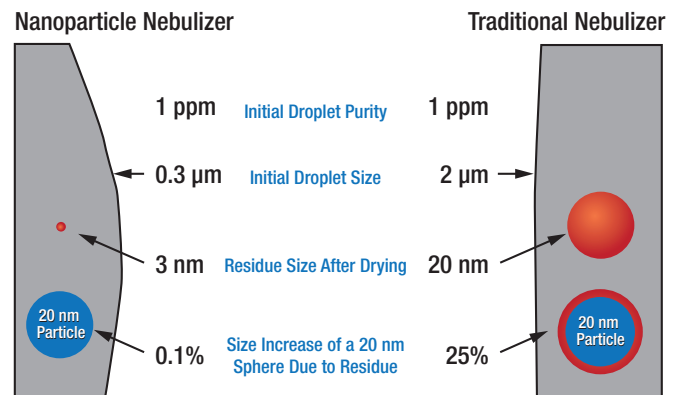


Figure 2: Nanoparticle Nebulizer minimizing non-volatile residue particle coating

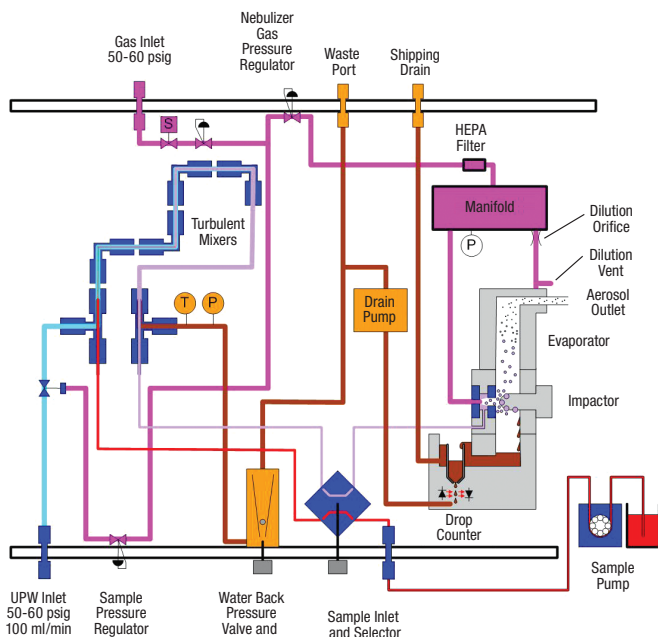


Figure 3: Schematic diagram illustrating the flow and internal components of the Nanoparticle Nebulizer.

Bibliography

Oberreit D. "A Nanoparticle Nebulizer for Generation of Aerosolized Colloid Particles with Reduced Influence by Non-volatile Residue." Poster Presented at 2014 AAAR Conference, Orlando, FL.

Specifications

- Peak droplet diameter:** <1.0 micrometer (nominally 0.3 micrometer)
- Droplet $dN/dLogDp >10 \mu m$:** < Peak $dN/dLogDp \times 10^{-5}$
- Inspection volume rate:** 0.2–1.0 $\mu L/min$
- Total flow rate (online):** 50–280 mL/min
- Nebulizer flow rate (direct):** 0.5–3.0 mL/min
- Response time to concentration change:** < 90 seconds
- Inlet water pressure (online):** 200–500 kPa (29–72 psig)
- Compressed air flow rate/pressure:** 2.5 std L/min CDA or Nitrogen, 2.8 bar (50–60 psi)
- Wetted surfaces:** PFA Teflon®, PTFE, sapphire, 316L, stainless steel, PEEK
- Ambient temperature range:** 15–35°C (59–95°F)
- Ambient relative humidity range:** 0–85% non condensing
- Maximum water temperature:** 80°C (176°F)
- Direct Injection:** 10–32 Standard Chromatography fitting
- Dimensions (WHD) cm (inches):** 23 (9) × 23 (9) × 35.5 (14) (46 (18) with fittings)
- Weight:** 6 kg (13.2 lb)
- Power:** Universal 100–230 VAC 50/60 Hz, 90 W max
- Output:** RJ-45 for Modbus, USB FlashDrive
- Internal storage:** Micro SD
- Ultrapure water inlet:** ¼ inch PFA Flaretek®
- Waste outlet:** ½ inch SS Swagelok®
- Compressed air inlet:** ¼ inch SS Swagelok®
- Detector vacuum:** ¼ inch SS Swagelok® Port
- Display:** 3.5 inch TFT Color, touch panel

Specifications subject to change without notice.

Kanomax of Japan purchased Fluid Measurement Technologies (FMT) in July 2015 and renamed the company Kanomax FMT, Inc. (KFMT). Dr. David Blackford, the founder of FMT is now the President of KFMT. He has nine issued U.S. patents, three U.S. patents pending, and many technical publications for his innovative technologies.

Patent Info: Patent numbers 8,272,253 and 8,573,034 have been issued to CTA and licensed by KFMT. Patent number 7,852,465 has been issued to KFMT.



Kanomax FMT, Inc.
 4104 Hoffman Road
 White Bear Lake, Minnesota 55110-3708 USA
 Phone (651) 762-7762
 Fax (651) 762-7763
www.kanomaxfmt.com

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