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Size Determination of Nanoscopic Droplet Beams by Transverse Impact of a Supersonic Free-Jet Expansion.[1] R.K. JUDAY, R.B. DOAK, Arizona State University — Droplet beams are developing into important tools for injection of hydrated macromolecules into vacuum for examination by x-ray and electron beams. Smaller is better in this pursuit and droplets are approaching nanoscale size, for which characterization by optical microscopy is precluded. Mie scattering offers size determination down to about $\lambda/2$, but is not trivial. New techniques for droplet size measurement are therefore of interest. We propose herein a method based on passing the droplet beam in vacuum through a gaseous free-jet expansion oriented transversely to the droplet beam. Directed impact of the gas against the droplets supplies transverse momentum, deflecting the droplets in a manner similar to the molecule-molecule scattering scheme of Buck, et al. [Phys. Rev. Lett. **52**, 109 (9184)] but with much larger total momentum transfer and in a quasi-continuum scattering regime that removes the ambiguities of molecule-molecule scattering dynamics. The deflection depends on the size of the droplet and so offers a means of determining droplet size and/or sorting droplets according to size and/or steering a droplet beam. This work presents an initial feasibility study to estimate the droplet deflection that is possible with existing supersonic free-jet expansions. The results indicate that this technique is eminently viable.

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