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Fabrication, Cleaning, and Filtering of Microscopic Droplet Beam Nozzles[1] J. WARNER, M. HUNTER, U. WEIERSTALL, J.C.H. SPENCE, R.B. DOAK, Arizona State University — Structure determination of proteins is a subject of intense current interest. Most relevant is a protein's native conformation, which generally requires it be immersed in water (if water-soluble) or a lipid jacket (if a membrane protein). Emerging schemes of serial protein diffraction propose to embed proteins in microscopic water droplets (membrane proteins encased in a detergent micelle) and pass these in vacuum through an x-ray or electron beam. Droplet diameters of <2 μm and <200 nm are dictated by the respective probe penetration depths. Rayleigh nozzles of <1 μm and <100 nm can deliver such droplets, but clogging becomes a major hurdle at nozzle diameters below even 10 μm. This talk will present an extensive study of the cleaning, filtering, and operation of 4 μm diameter nozzles with intent to minimize clogging. Borosilicate and fused silica nozzles were investigated in both commercial and self-fabricated forms. Equipment was developed to flush the nozzles from both the tip and distal ends. A variety of solvents and detergents were tested, with and without sonication and both before and after the nozzle tip was formed. Flame burnishing was employed to smooth and clean the nozzles. *In situ* formation of silicate filter frits was investigated. Still, only about 30% of the 4 μm nozzles would run without clogging. An alternative to solid convergent nozzles will be described.

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