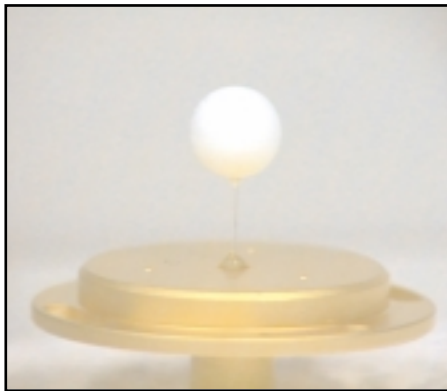


ICF Target Support Highlights

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August 1999

General Atomics, with our partner Schafer Corporation, serves as the ICF Target Support Contractor, providing target development and fabrication and target system engineering development to support the ICF program at five ICF Labs — LLNL, LANL, NRL, SNL, and UR/LLE. This informal newsletter contains highlights of that support for August 1999.

GA/Schafer onsite staff at LLNL, LANL, and SNL fabricated, machined, assembled and characterized about 150 targets of various kinds for experiments on Omega, Trident and Z. We fabricated, characterized, and delivered more than 200 targets and target components, including micromachined hohlraums, witness plates, plastic and glass microballoon capsules, and flat foil targets of various materials and configurations to LANL, LLNL, NRL, SNL and UR/LLE for experiments on Nike, Omega, and Z.

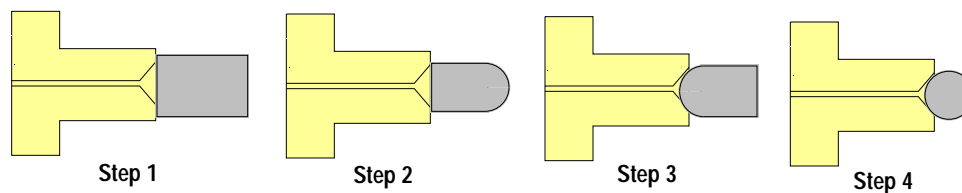


We recently received a request for micromachined polystyrene foam spheres 5 mm in diameter from Dave Hansen at SNL to be used for evaluating the partitioning of x-ray heating in the Z-pinch. The bulk polystyrene foams were made by Diana Schroen-Carey of Schafer. The process for making the SNL foams is similar to the published LLNL and LANL techniques, but with three adaptations that tailor the foams to SNL's specific needs. First is the elimination of the sodium persulfate as the radical initiator because it adds oxygen to the polymer structure, which interferes with some of the SNL diagnostics. Next, a higher percentage of organic material is incorporated in the emulsion, which softens it and makes it easier to cast into the required cylindrical shape. Finally, the processing techniques were modified to accommodate the more viscous solution. Approximately 125 ml of foam was mixed and cast in each batch, then weighed and radiographed to confirm density and uniformity.

Joe Smith of GA developed a four-step technique for micromachining the foam spheres. Step 1 below shows a cylindrical "pill" of the polystyrene foam held in a vacuum chuck adapter. This adapter is a brass fixture with a conical depression on the front face that is connected to the vacuum passages of the vacuum chuck (not shown) by an axial channel. The conical depression has an included angle of exactly 90° so that the location of the equator of the sphere can be accurately located from the geometry of the sphere and holder. The mounting face, the conical depression and the o.d. of the adapter are all diamond-turned during the same set-up to assure concentricity. This method of mounting the foam blank is possible because, although the foam has connected porosity, its effective flow conductance is very small.

The next step in the fabrication of the spheres is to machine the outside diameter of the cylinder to the size of the sphere, then machine a hemisphere on its end, as shown in Step 2. At this juncture, the foam blank is released from the vacuum chuck adapter and remounted with the hemispherical end seated in the conical depression (Step 3).

In Step 4, a second hemisphere is machined. Great care must be exercised to assure that the terminators of the two hemispheres fall on the equator of the sphere. Because of the highly frangible nature of the polystyrene foam, the part must be handled with great care. After the initial machining of the blank (Step 1) it was always handled only with rubber-tipped vacuum tweezers. Even with this precaution, the tweezers, as well as the contact circle with the conical depression, left a very slight depression in the material. These marks disappeared within a few minutes of the end of the machining operation. A completed foam sphere suspended from a hohlraum endcap is shown in the photograph above.



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