ICF Target Support Highlights

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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 November 1998.

GA/Schafer onsite staff at LLNL, LANL, and SNL fabricated, machined, assembled and characterized about 200 targets of various kinds for experiments on Nova, Omega, Trident, and Z. In a month of very heavy target orders, we fabricated, characterized, and delivered more than 600 targets and target components, including micromachined hohlraums, witness plates, and foams to LLNL, LANL, and SNL for shots on Nova, Omega, and Z, plastic and glass microballoon capsules to LLNL, LANL, and UR/LLE for shots on Nova and Omega, and flat foil targets of various materials and configurations to NRL and UR/LLE for experiments on Nike and Omega.

LANL and LLNL physicists are now doing indirect drive experiments on the Omega laser at the University of Rochester. The standard hohlraums used on Nova have ~30 µm thick walls and would introduce too much debris into the Omega chamber. Only about 2 µm of gold is needed to convert the laser beams to x-rays for indirect drive, but walls this thin would be too fragile to handle. To reduce the amount of high-Z material used, LANL developed the “thin-walled hohlraum” concept whereby a thin layer of gold is supported by a thicker layer of plastic for support. Jim Kaae and Clyde Shearer transferred this concept to GA and developed it into a production process.

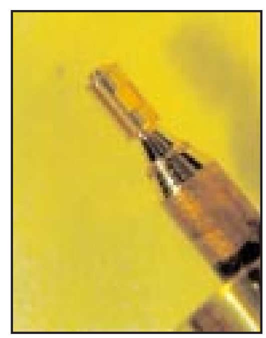
The sequence of five photographs show the various steps in the fabrication of a thin-walled gold hohlraum incorporating a machined plastic over-coating, which provides mechanical strength. Starting from the left, the first step, which is performed in an EMCO CNC lathe using a carbide tool, produces a copper mandrel that is slightly oversize. In the second step, the final dimensions and the surface finish of the mandrel are produced in one of the diamond-turning machines. The third step is to electroplate a thin (2-5 µm) gold coating on the mandrel, which is then dipped in epoxy in the fourth step. In the fifth and final step the mandrel with its coatings is returned to the diamond-turning machine and the epoxy is machined to its final dimensions. The strict specifications on the plastic overcoat thickness (typically 50 ±10 µm) require use of special fixtures, pioneered by LANL and refined by GA (see ICF Target Support Highlights, Oct. 1997), when removing and replacing the mandrel in the diamond-turning machine. The hohlraum is shipped with the copper mandrel intact; it is etched away by LLNL or LANL prior to use.

Rough Copper Mandrel

Diamond-turned Copper Mandrel

Gold-plated Mandrel

Mandrel with Plastic Coating



Final Machined Plastic-coated Gold Hohlraum on Copper Mandrel

Production sequence for fabrication of thin-walled hohlraums for use on the Omega laser at the University of Rochester.

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