Laser Cavity Fabrication

Labsphere's Spectralon® diffuse reflectance material combines extremely high reflectance with nearly perfect diffuse scattering making it the ideal material for laser cavity fabrication, giving a highly uniform pumping of the laser media.

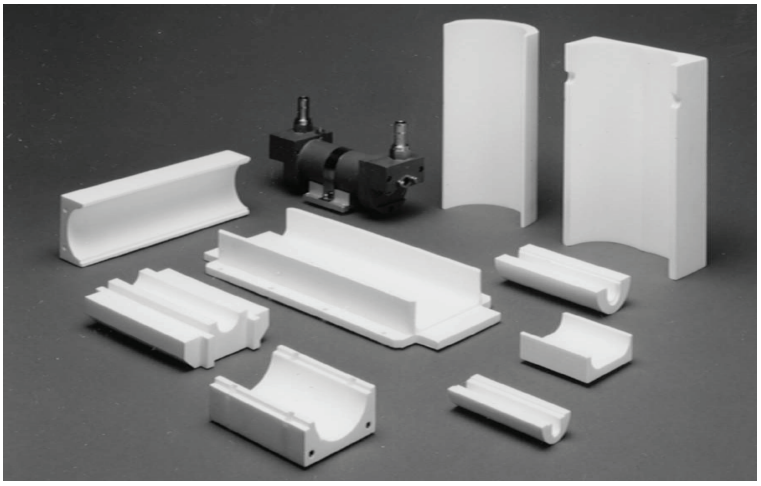
While laser output power is crucial, beam quality is paramount for various applications. A Spectralon-equipped laser offers enhanced and more predictable beam quality due to uniform pumping of the laser medium, resulting in improved spatial uniformity, reduced non-symmetrical optical aberrations, and diminished hot spots.

Against ceramic materials, the efficiency difference could be as much as 19%, leading to a significant gain in laser power. Compared to a specular gold-coated cavity, the improvement in laser power lies between these extremes, with a reported gain of 7% from Spectralon.

Specular reflectors often suffer from parasitic oscillations, limiting maximum extractable energy and posing risks to expensive optical components. Diffuse reflectors, such as Spectralon, substantially reduce the risk of parasitic oscillations, enabling designers to tap into the full output potential of the system.

Spectralon has undergone stringent testing with regard to long-term reliability when exposed to flashlamp radiation for many shots. Over a million shots at an average pump energy of 225 watts were put into a Spectralon laser cavity with no sign of degradation.[1] Some users have put many millions of shots onto Spectralon without any visible degradation. However, Spectralon does require special cooling considerations when used in laser cavities.

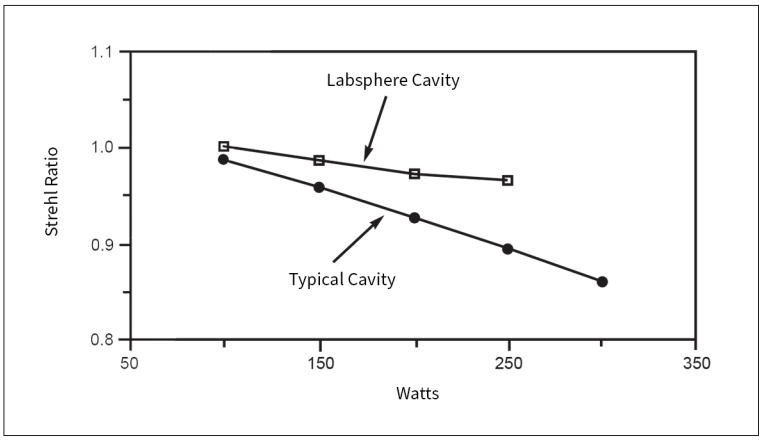
[1] Rockafellow, D., 1989, *Pumped Cavity Test Report* ; prepared by Big Sky Laser Corp.



Labsphere welcomes inquiries on the customized fabrication of laser cavities including large OEM orders. Special coupling geometries can be produced in Labsphere's dedicated Spectralon Fabrication Facility, thus providing maximum flexibility in prototyping new cavity designs.

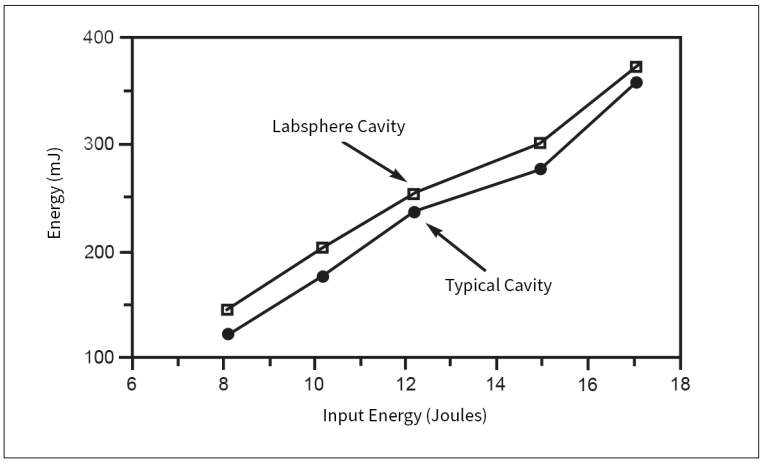
Applications:

- Product Development
- Medical Laser Systems
- Laser Rangefinder Systems



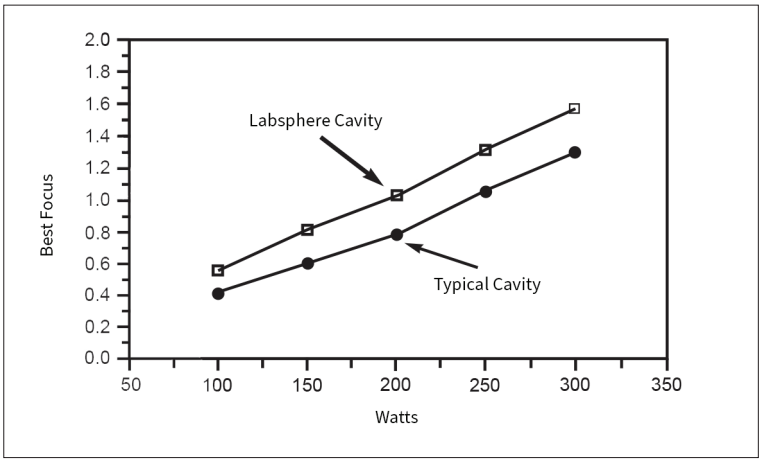
Strehl Ratio vs. Input Power (watts)

Strehl Ratio
The Strehl ratio for a perfect optic is 1.000, but as the input lamp energy increases, distortion invariably takes place and the Strehl ratio falls. As the lamp is flashed, the rod is distorted thermally from the localized heating and nonuniform cooling. Labsphere cavities perform exceptionally well in this measurement, exhibiting very little distortion and demonstrating their uniform pumping characteristics.



Input vs. Output Energy at 10Hz, 30% Reflector

Input vs. Output
This plot shows the resonator output energy per pulse at 10 Hz versus the input energy per pulse into the flashlamp. As the flashlamp is pumped harder the output energy increases. Labsphere cavities exhibit slightly higher efficiencies than typical cavities.



Focus vs. Input Power for LCA Series

Focus vs. Input Power
When comparing focus versus input power, Labsphere cavities exhibit better focusing characteristics than typical cavities. Measuring with the same rod and lamp, these cavities permit the lasing medium to absorb more light from the flashlamp, giving higher efficiencies.