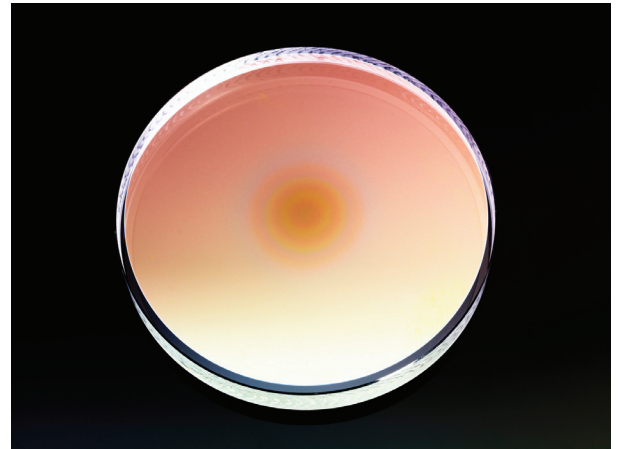


## Graded Reflectivity Laser Mirrors for Laser Beam Profile Shaping

Graded reflectivity mirrors enable precise spatial shaping of both the intensity and phase characteristics of laser beams. This is accomplished because the reflectivity and/or phase effects of the coating vary radially across the surface of the optic. REO can produce these mirrors with virtually any arbitrary variation, including non-rotationally symmetric patterns, as well as with complex designs in which the reflectivity increases and decreases repeatedly across the component.

The most common application for graded reflectivity mirrors is as cavity optics in unstable resonator lasers. In this case, the use of a second order Gaussian or super-Gaussian (Gaussian<sup>n</sup>) reflectivity profile allows both maximum power extraction from the resonator, as well as a smooth far field output beam profile. A Gaussian profile mirror can also be used to achieve laser output with a uniform irradiance distribution, which is often required in illumination, materials processing and surgical applications. And the ability to shape the phase of a laser's emergent wavefront can aid in achieving better focusing characteristics, and improve coupling efficiency into optical fibers.



REO offers these graded reflectivity mirrors on a wide range of substrate materials, including fused silica, various optical glasses, ZnSe, ZnS and Si, for operation over the 266 nm to 5  $\mu$ m spectral range. These mirrors are available with diameters from 0.25 inches (6 mm) to 5 inches (127 mm). Reflectivity pattern variations can be achieved down to a scale of approximately 1 mm. The use of ion beam sputtering (IBS) coating technology makes these optics suitable for intracavity laser use, and provides a unique combination of high damage threshold, spectral stability, environmental stability and mechanical durability that makes them compatible with other harsh and demanding environments.

### Typical Specifications

Substrate Material	Fused Silica, optical glasses, ZnSe, ZnS and Si
Design wavelength range	266 nm – 5 $\mu$ m
Typical Reflectivity Profiles	Gaussian Gaussian <sup>n</sup> Non-rotationally symmetric patterns
Damage threshold	10 J/cm <sup>2</sup> , 20 nsec pulse at 1064 nm
Surface flatness (@ 633 nm)	$\lambda/20$
Surface quality	10-5
Size range	0.25" to 5"
Clear Aperture	90%
Temperature range	-196 °C to 400 °C
Humidity range	0 to 100%