December 2017

Newsletter

LBP Optics

Metal mirrors, applications, coatings & materials

ULO Optics takes over LBP

In August 2017, Hertfordshire-based infrared optics manufacturer ULO Optics took over Laser Beam Products. Premises and staff remain unchanged and we are now operating as LBP Optics Ltd. This change means that we are now able to offer increased production capacity, additional technical expertise and resources. If you wish to place an order please note that the company name and banking details have changed. Contact us at the office if you require more information.

Polishing graphite

We recently polished some large graphite blocks 200mm long, and achieved sub-micron flatness.

We can also polish spherically curved graphite surfaces for use as seals in chemical pumps, food processing and steam joints.

Graphite is a highly useful form of Carbon. It is inert in most chemical environments. An unusual property is its electrical conductivity combined with its strength increase with temperature. It's often used in CVD processes as a substrate for growth plates.

Spherical mirrors

With the recent takeover by ULO Optics, LBP Optics has greatly expanded its range of tooling and metrology for spherically curved mirrors.

We now have over 300 sets of master tools and test plates, along with a range of "transmission spheres" for our interferometers. These cover a wide selection of concave and convex mirrors from a few millimetres to sixty metres Radius of Curvature.

Typical uses are as end mirrors in multi pass gas cells, collection optics for lamps, beam correcting optics, "rear mirrors" in CO_2 laser resonators, and as the input and output mirrors in reflective infrared beam expanders.

Because our mirrors are chemically polished, rather than diamond machined (SPDT), the reflective surface is exceptionally smooth and free from the "bullseye" surface ripple common with SPDT mirrors.

LBP Optics Limited Stratton Park, Dunton Lane, Biggleswade SG18 8QS
T: +44 (0)1767 600877 F: +44 (0)1767 600833 e: sales@lbpoptics.com **www.lbp.co.uk**

Stress risers & mirror thickness

We like a challenge, and often say:

"If it can be engineered, we can turn it into a mirror."

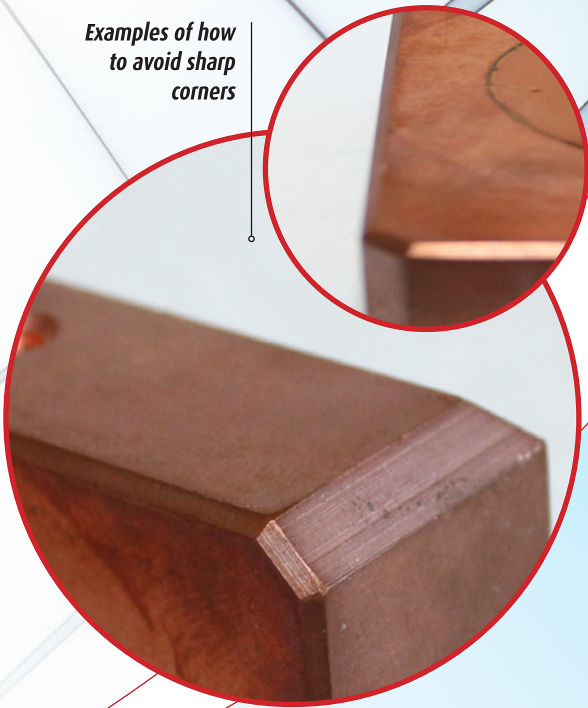
Some designs though are best left on the drawing board.
Two areas can be problematic:

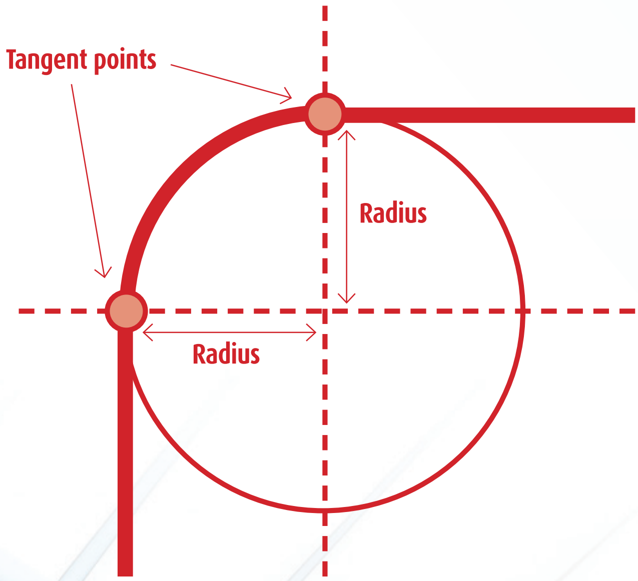
- **THICKNESS** - a good rule of thumb is that a mirror has a thickness at least 1/5th of the diameter/diagonal. Whether from glass or metal, standard mirror sizes include 25mm diameter x 6mm thick, 50mm diameter x 10mm thick etc. High precision flat reference surfaces will be thicker still.

  The reason we use this rule is because deforming forces can be applied during polishing/coating, when being mounted, or in motion. The ability of a mirror to resist deformation in response to an applied force is its "stiffness". A thicker stiffer mirror is a better mirror. Stiffness is proportional to the cube of thickness, so just a small increase in thickness improves reliability and reduces cost.

  To reduce thickness, and often weight, one solution is to use a high stiffness material such as Silicon Carbide or Beryllium, but they can be expensive and difficult to process. It can be better to slightly increase the thickness of a conventional mirror and benefit from the cubic increase in stiffness, than to use an exotic expensive material.

Examples of how to avoid sharp corners





- **STRESS RISERS (OR CONCENTRATORS)**

  In 1954 a DeHavilland Comet aircraft experienced explosive decompression en route to Rome. All 35 on board were killed. After extensive investigation turbine modifications were made to all Comets, and the planes were once again allowed to fly. However just weeks later the same thing happened again and 21 passengers and crew were killed.

  This incident caused further investigations and it was found that the corners of the square windows acted as "stress concentrators" where cracks could easily initiate and cause the whole window to rupture. Since then aircraft windows are designed with oval or smoothly rounded profiles.

  Stress risers, or stress concentrators, are discontinuities that cause an object to experience a local increase in the intensity of a stress field, e.g. sharp corners, notches, and changes in the cross-sectional area of the object. High local stresses can cause objects to fail more quickly, so engineers must design the geometry to minimize stress concentrations.

  A simple design guide is to consider for any corner or profile in a mirror the R/T value (R = Radius T = thickness). A large R/T value, ideally larger than 1, is recommended.

And finally ...

Come and see us at Photonics West 2018

We will be exhibiting alongside our colleagues from ULO Optics

27 January – 1 February 2018
The Moscone Center San Francisco, California, United States

Booth #5137

SPIE. CONNECTING MINDS. ADVANCING LIGHT.

LBP Optics Limited Stratton Park, Dunton Lane, Biggleswade SG18 8QS
T: +44 (0)1767 600877 F: +44 (0)1767 600833 e: sales@lbpoptics.com **www.lbp.co.uk**