Instructions on handling LBO crystal (Rev1)

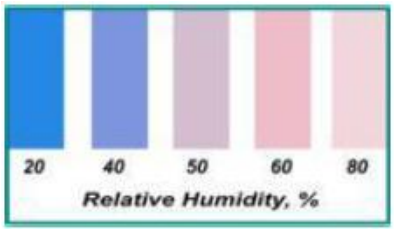
By Eduardas Gvozdas, dated: 2016.03.04

Handling and use environments

LBO is a moderately hygroscopic crystal. The AR coating is not a 100% longterm protector of polished LBO surface from atmospheric moisture. Therefore, a rule of handling LBO crystal is to minimize its contact with humid environment. Below are the requirements for maintaining dry conditions for LBO crystals, both coated and uncoated:

• Unpack, inspect and clean crystals in a clean room with controlled atmosphere with relative humidity (RH) of <30%.

• Use a humidity meter with accuracy 2% or better to measure RH. Additionally, use moisture indicator to control the humidity in storage container or in a point of use. A color change from blue to pink gives a visual indication of rising moisture levels.



• After inspection, immediately place the crystals in an airtight container with sufficient amount of DRY desiccant as shown on photo.

• When testing a crystal, do not allow its cooling below room temperature: the water vapor will condense on the crystal and reduce its lifetime.

• When designing laser system, consider resistive heater as an alternative to circulating water for LBO crystal thermal management. The operating temperature should be 20-30 °C above room temperature. Put sufficient amount of desiccant inside laser head and seal it tightly.

• In case of contact with humid air, dry off the crystal in a drying cabinet at 70 °C for >3 hours. This will remove absorbed water from side facets of a crystal. Provide same operation with desiccant.

Cleaning

Foreign matter or fingerprints on the optical surfaces cause reflection losses (transmission losses) and laser damage. They have a major influence on low-loss coatings, in particular. This contamination can be clearly seen under microscope (x10 magnification). Wipe off the foreign matter with pure cotton swab slightly soaked with ethyl acetate. Wipe in a single direction while applying a slight pressure. Scrub with greater force if the foreign matter is difficult to remove. Use a fresh swab to clean a new surface. Repeat the cleaning until any residue disappears.

Laser damage

In designing a laser system, we recommend taking the beam diameter and space profile (peak power) into consideration and suppressing the maximum energy concentration below half the threshold value of the coating. Altechna proposes this for safe laser operations in the event of design errors, beam fluctuation or deterioration of the optical surfaces under long-term use. Seizure from dust in the atmosphere, out-gas from the casing or glue, etc., may cause laser damage.

Such damage frequently occurs in high-speed repetitive lasers and CW lasers, in particular. They occur even at very low energy concentrations. Impurities are decomposed by the laser beam and accumulate like a film. Thus, the laser radiation point looks white or discolored.

It is necessary to use a structure preventing dust or out-gas from adhering in order to prevent such damage (e.g. a closed loop gas purge system, patent WO 03/105292 A1, hardware example: PACU Pure Air Circulator Unit by THORLABS). If this is impossible, we recommend observing the surface condition, maintaining gas humidity level at <30% (better <20%) and cleaning the surface periodically to prevent damage.

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