

CLEAVING AND POLISHING MgO CRYSTAL SUBSTRATES

Information for cleaving and polishing MgO single crystals

Cleaving the MgO Single Crystals

The MgO single crystal material supplied by SPI Supplies is normally cleaved very easily by using either a small knife (or better still, a [single edge GEM type razor blade](#)) and a small hammer. This should always be done [on a clean, lint-free work surface](#) and a relatively dry environment.



The procedure is to place the blade parallel to one of the existing edges, and then tap lightly with the small hammer. Cleaving occurs instantly and the only time there is a problem is when the razor blade being used gets dull (it should be changed after every several cleavings). In practical terms, a 2 mm thick slab is probably the lower limit in thickness that can be obtained this way.

One note of caution: It just would not make sense to "pre-cleave" into desired thicknesses since you would then lose the benefit of a surface that was "freshly cleaved". That is also the reason why our firm does not offer smaller cleaved pieces, we believe it would result in inferior results.

Never lose sight of the fact that the advantage of the use of these freshly cleaved substrates is that the cleaving produces a very flat, relatively clean surface. However, it must be prepared immediately and then placed in the vacuum chamber of the system being used for the deposition, followed by an immediate pump down, which is then followed by the deposition of one or more thin film coatings.

However, obtaining a perfectly cleaved (100) block is not easy without first some practice and certainly it is not easy doing the cleaving without generating at least some "chips". The MgO crystals are grown with (100) orientation, so this kind of cleaving along the (100) plane is usually not all that difficult by the method described above.

However, a multiwire sawing machine is used when processing to wafer form from the MgO boule in order to achieve far superior tolerances for the cut.

Information for Polishing MgO

Some uses of MgO requires polishing and the polishing of MgO is fairly similar to that used for other crystals of electronic materials. But the cleaning and packing steps do require much more attention to detail and care than most of the other materials.

If one sees a white haze on the MgO surface, it is usually because it has been exposed to air for more than three days, in humid environments, the exposure time to haze being less. The material is moisture sensitive, so must be handled (and stored) under dry conditions. Clearly, one must use a non-aqueous polishing media should one want to polish away water spots from the surface of the MgO crystal.

Moisture sensitivity

MgO is almost insoluble in water, however it should not be kept in a moist, high humidity environment for prolonged periods of time. For storage, it should always be kept in a [desiccator cabinet](#). For polishing or repolishing MgO, non-aqueous media should be used at all times.

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