Ask The Oracle

Question - to be answered in the next issue

Some material, notably Corundum and CZ, show directional properties when cutting. This means that some facets take an age to cut whilst others cut very quickly and are easy to overcut.

What causes these directional properties?

Answers to Last issue's Questions:

<u>Why do you cut the pavilion first?</u> -Answer by Mike Richardson

The short answer is that it is a matter of convention. With most patterns it is perfectly possible and just as easy to cut the crown first.

Having said that, I will give some reasons why cutting the pavilion first may have become the convention.

It is easier to accurately orientate a gem within the rough if we have a flat surface as a reference plane; therefore we grind a flat surface and stick it to the dop. It now becomes more efficient to proceed with the pavilion first. The pavilion so produced is easily positioned with respect to dop centre, either dop centred or otherwise, thereby making for an accurate transfer.

The angles of the pavilion facets are more critical than those of the crown facets. We get the pavilion correct and if we find we are short of material for the crown, we have the option of reducing the crown angles. If we cut the crown first and then find we are short of material for the pavilion, our options are limited to either reducing the pavilion angles, thereby running the risk of approaching or going below the critical angle and deadening the stone, or having a flat culet facet. Both of these options will reduce the optical quality of the stone. The only remaining alternative is to recut or reduce the size.

Some patterns require a preform in order to establish the relative lengths of the girdle facets. There is more material available for preforming in the pavilion than in the crown. This means higher more comfortable preform angles can be used to cut to a point, with less waste of material.

How to Polish Quartz on Perspex -Answer by Mike Richardson

A Perspex lap (Lucite in the US) charged with one of the metal oxides is one of the oldest and most popular established ways of polishing quartz and many other gemstones of hardness 7.5 and below. The commonest oxides are cerium, tin and aluminium oxide. The latter is sometimes referred to by a trade name “Linde A”. Cerium oxide is the one used mostly with quartz and beryl, the others will polish the slightly harder gems such as garnet although they also work on quartz.

The perspex lap needs preparing so that it retains the oxide powder. Some authorities advocate tangential scoring of the lap with a knife whilst others suggest running a metal turners’ knurling tool over the surface. My preference is to use a 160 grit wet and dry silicon carbide paper on a sanding block and simply remove the glazed surface. The myriad of minute scratches so produced will retain the microscopic particles of oxide powder much better than the fewer number of relatively huge gouges produced by the knife or knurling tool. As in many faceting techniques, try as many as possible and decide what works best for you.

The powder needs mixing with water into slurry and applying to the slowly spinning lap with a clean fingertip. The rest is a matter of feel, practice and experience. You must manipulate the following variables to get the best result for the stone you are polishing; lap speed, pressure, wetness and direction. You must pay attention to cheater adjustment so that the facet contacts the lap fully. This is best done by loosening off the hard stop so that the quill can float, thereby enabling you to set the vertical adjustment both ways by means of the mast height adjuster.

A good polish with the softer oxides like cerium is very dependent on the quality of the prepolish. It should be a uniform surface as produced by a worn 1200 or 1800 grit lap and there must be no scratches, these will not polish out.

It has long been established that the final polish produced by cerium oxide and perspex on quartz, as well as other combinations of oxides, stone and laps, is not just a continuation of the cutting process, cerium oxide is softer than quartz. A flow of the surface takes place on an atomic scale caused by heat and friction. This has been ascribed to a combination of chemical reaction and local heating of minute high spots, causing a molecular disturbance of the surface of the gemstone which produces on cooling, an amorphous (glass like) layer. This glass like layer is slightly harder than the basic hardness of the material hence the futility of trying to remove a scratch on a near polished large facet with too fine a lap. This surface layer was discovered by Sir George Beilby in 1921. Further study has revealed that this layer can in some minerals crystallise on cooling. To produce a beautiful Beilby layer type of polish, it is necessary that the oxide powder that you use has a higher melting temperature than the gemstone.

Having sung the praises of a Beilby layer type polish achieved with cerium oxide and perspex, I beg the question in this day and age, why bother? There are available ‘Ultra’ laps which are disposable laps, usually made from 0.003” drafting film which come coated with various polishing oxides and even diamond. They are used on a master lap and although classed as disposable, they last a long time.

Alternatively, modern wax based diamond polishes come in grades which cut and in the finer grades, produce a Beilby layer type of polish with much less hassle, thereby giving you a seamless transition from cutting to polishing.

Do you have any questions that you would like answered?
If you do then send them in to the editor.