

## **Gems & Gemology Data Depository**

Faceting notes from Robert C. Buchanan to accompany: E. Emerson and P. Johnson, "Gem News International: Colorless petalite and pollucite from Laghman, Afghanistan," Summer 2009 *G&G*, pp. 150–151.

### **Petalite – Afghanistan**

- **Rough material weight:** 76.99 ct
- **Equipment used:** Fac-ETTE Gem Master 2
- **Size, shape, clarity, etc. – initial assessment:** 18 x 20 mm rectangle, 18 mm deep one end, 11 mm deep opposite end, flat crown surface, deeply grooved irregular pavilion area; clear/clean except one corner of deep end where it had been hit with hammer – left 6 x 7 mm fractured area to 6 mm depth. Best use would be 17.5–18.0 mm square with relatively low crown to maximize carat weight. Custom “4 shields” design will work and provide 30–32 ct finished stone. The center point allows 14.5 mm depth which is marginable but workable for this configuration. Would eliminate shattering above corner of crown but leave underlying conchoidal fracture at or just below girdle approximately 5 x 6 mm size.
- Mohs hardness = 6.0–6.5; RI = 1.50; critical angle = 41.5 degrees
- **Optimum recovery plan:** Cut clipped corner 149 facet square configuration noted above using 43 degree culet and low crown angles as required similar to those used for “checkerboard” designs. Target 30 ct minimum.
- **In-process findings:** After careful preliminary grinding and prepolishing around shattered corner to better examine the problem, found that the underlying conchoidal fracture exhibited strong “rainbow” colors, so would be very obvious in finished stone. Also did not appear stable – possibility it would “travel” and/or break during faceting. Certainly not stable enough to allow pressure for application of prongs in a setting. Additionally, learned from Farooq that it is the norm to find “clean” faceted Petalite stones – would be abnormal to find a flawed, especially a deeply flawed, stone on the market.
- **Revised cutting plan:** The only way to avoid fracture and have decent sized stone from this large piece of rough was to cut a round stone and downsize to a max of 17 mm. By moving culet as required to accomplish that, would only have 12.5 mm maximum depth to work with vs. 14.5 mm in original plan. The reduction in diameter and depth plus shape would dramatically reduce carat weight recovery. Chose a “fancy” round design that fit the depth parameters.
- **Finished size, weight:** 16.85 mm round x 12.25 mm; 14.98 ct; 19.46% yield. This is one-half the yield that this rough should have provided, but for the indiscriminate use of a hammer.
- **Cutting, polishing characteristics:** Was advised due to brittleness it would be wise to use 600 lap and finer. Given large size of the stone, decided to experiment very gingerly using well-worn 260 lap to preform the pavilion. Used speeds from 15% up to 60% without any problem. For safety purposes, reverted to 360 lap to complete last 25% of perform cutting. No problem. Cut pavilion facets with 600 lap, final adjustments with “aggressive” 1200 steel lap, pre-polished with 1200 non-aggressive Mylar. No problems with performance of any of the laps. (Note #1: Ran into a previously invisible horizontal fissure 7 mm long, slightly “V”-

shaped, jagged edges, approx. one-third of the way from girdle to culet. Complete surprise. It didn't show under strong light and continual close scrutiny until I cut into it. Possibly liquid filled? Was not cleavage plane fracture. Had to cut over 1 mm deep to eliminate, lowering girdle, minimizing available crown material. Necessitated reduction of diameter from 17.0 mm to 16.85 mm to provide minimum required crown height.) Lapidary publications suggest using aluminum oxide as primary consideration for polishing. Cerium oxide as secondary consideration. I find cerium oxide generally polishes faster, better, and without as much scratching problems for material that will polish with it, so decided to try "Spectra," a very fine cerium oxide on Mylar. Obtained great fast polish (almost as fast as comparable sized quartz) with absolutely no scratching, edge abrasion or galling. (Note #2: Expected soft grain on opposing sides of stone – e.g., 96 and 48 index settings. Found the soft area on only *one* side on both pavilion and crown, spread across width of two adjoining facets in each case. Difference in hardness and cutting minimal.)

- **Finished stone description:** Used Jeff Graham's 185 facet round "Light Star" configuration designed for low-RI quartz. Revised the culet angle from 40.75 to 43.00 degrees and all other pavilion angles accordingly using the arc tangent ratio formula. Left the crown angles as designed which have 36.13 degree mains. Decided not to add 32 additional optional crown facets for aesthetic and scintillation purposes adjacent to table because of GIA's reputed preference for the larger table size (near 50%). A very fine remnant of the pavilion fissure was deliberately left in as GIA likes to see natural inclusions and other features. Using faceter's incandescent lamp directly above the stone's table, the reflection off of the pavilion is very bright for a low-RI stone and radiates across the table area and about one-half the distance from table edge to girdle across the crown facets. The stone must be moved a little from side to side for the reflection to light up the outer perimeter of the crown facets. Under a ceiling that had multiple fluorescent fixtures with light coming from multiple angles, the entire crown lit up with reflection from pavilion facets.

#### **Pollucite – Afghanistan** (#1 of 2 pieces)

- **Rough material weight:** 35.8 ct
- **Equipment used:** Fac-ETTE Gem Master 2
- **Size, shape, clarity, etc. - initial assessment:** 17 mm wide x 20.5 mm long x 11.6 mm depth (center). Has flattened sloping "keel"; somewhat mounded odd shaped crown area, square on two sides and one end with relatively thin sliver on opposing end that is pointed in center. Some small peripheral fractures. Depth will drive stone size. Best use is clipped corner square. Natural depressions preclude straight 90 degree corners.
- Mohs Hardness = 6.5–7.0; RI = 1.52; critical angle = 41 degrees
- **Optimum recovery plan:** Once sides are ground to allow crown and crown area is flattened as required, target 12.5 mm square or slightly higher if possible. Relatively clean stone. Use 42 degree culet, adjust crown to fit material. Should yield 10.5 ct stone minimum, 11.5 ct outside high.

- **In-process findings:** No surprises or problems except natural grooves across center of crown are deeper than thought. Reduce finished depth as required.
- **Revised cutting plan:** N/A
- **Finished size, weight:** 12.8 mm square x 10.7 mm depth. 11.3 ct finished weight = 31.6% recovery. Fits within targeted recovery objective.
- **Cutting, polishing characteristics:** Encyclopedic data says pollucite is “extremely brittle” and all cutting and faceting should be done with fine laps extreme care. Fifteen-year-old data also says it is rare to find a rough piece 10 ct or more. Since this is first experience with this material and it is not mine, decided to do all performing and initial faceting with “aggressive” 1200 steel/diamond lap. To my surprise it cut quickly like butter. More like opal or fluorite than a stone with quartz hardness. No chipping or fracturing problems. No soft/hard facet differential on any facet orientation. Published polishing recommendations show aluminum oxide on certain lap types as first two choices. Third was cerium oxide on Lucite. Decided to try “Spectra,” a super fine cerium oxide on Mylar. The stone polished extremely fast (faster than comparable sized quartz) with no scratching, chipping, or abraded facet edges which I was concerned with given reputed brittleness. In fact, produced sharp facet edges and polished such that it looks “wet.. This material was a dream to cut and polish. Have experienced none better.
- **Finished stone description:** Used Jeff Graham’s 109 facet “Double Cross Square” pattern, no changes except revised angles to suit this RI using arc tangent ratio formula. The reflection off of pavilion using 42 degree culet is excellent. With direct overhead light, the reflected “cross” pattern is prominent IAW the design objective. Cross shows corner to corner, culet to girdle. With small movement from side to side, or with additional peripheral light source(s), the surrounding pavilion facets light up brilliantly. A lot of scintillation with this stone.

**Pollucite – Afghanistan** (#2 of 2 pieces)

- **Rough material weight:** 52.59 ct
- **Equipment used:** Fac-ETTE Gem Master 2
- **Size, shape, clarity, etc. – initial assessment:** 12.7 mm W x 23 mm L; depth very irregular – 15 mm one end, 5.5 mm center of other end, deep natural crystalline groove through center portion. This center depth critical to maximum width but cannot be measured as is surrounded by thicker material. Best estimate = 9.5 mm. The thin end with irregular grooves (6–7 mm) on pavilion side unusable – must be ground off. Stone clarity is excellent. Only a few small peripheral fractures/veils that will be removed with performing.
- Mohs hardness = 6.5–7.0; RI = 1.52; critical angle = 41 degrees
- **Optimum recovery plan:** Attempt to obtain 12 x 16 mm rectangular shaped stone – final depth determination will drive depth and configuration options of pavilion as well as width.
- **In-process findings:** Thin end ground off, table area leveled for dopping. Remaining useable material AIG (“After Initial Grind” to derive basic shape =

\*38.6 ct) Depth should support radiant pavilion if the culet is slightly “tipped” (flattened) and crown angles are lowered below median as required.

- **Revised cutting plan:** Used Jeff Graham’s rectangular cushion design for scintillation plus weight retention – almost a Barion design. Slightly “tip” the culet, use lowest acceptable pavilion main angle at 42 degrees; reduce crown mains six degrees.
- **Finished size, weight:** 11.75 mm x 15.6 mm x 9.85 mm, 12.1 ct. This = 23.0% recovery based on total rough material weight; 31.3% recovery based on useable (AIG) rough material. After initial pavilion faceting, was not left with sufficient material for lowest reasonable crown. Recut 12 x 16 mm to 11.75 x 15.6 mm to gain slight increase required for reasonable crown angles/depth.
- **Cutting, polishing characteristics:** A dream to cut and polish. See comments under previous stone.
- **Finished stone description:** Used Jeff Graham’s 89 facet “Signature” rectangular cushion design without modification except for recalculation of angles to fit this material’s RI and material availability for pavilion/crown. Great reflection off of pavilion facets.