

## **Gems & Gemology Data Depository**

Faceting notes from Robert C. Buchanan to accompany: R. Befi, "Gem News International: Diopside from Ihosy, Madagascar," Spring 2010 *G&G*, pp. 65–66.

### **Diopside – Madagascar:** (#1 of 2 pieces)

- **Rough material weight:** 31.83 ct
- **Equipment used:** Fac-ETTE Gem Master 2
- **Size, shape, clarity, etc. – initial assessment:** Flattest side face-up is ~14 x 14 mm square, but natural crystal facets on sides cut steeply from "top" edges towards culet area. If this was thick stone, would need to cut periphery to about 12 x 12 mm to have material for minimal crown. However, this rough has several problems. First and foremost is the stone thickness, which is 8 mm, which restricts stone width. On bottom of stone, it has large natural depression across culet area about 0.50 mm deep. On top center there is 1.0 x 1.75 mm white "bubbly" shaped inclusion that penetrates "table" area ~½ mm, with fine fractures penetrating ~¾-1.0 mm below that. Maximum depth of this finished stone will be 7 mm, leaving fine table fractures in the stone. Depth will drive width of the stone. Additionally, the stone has numerous white "bubbly" inclusions near the natural crystal surfaces around the periphery of the stone, and a number of fractures – most notably stacked parallel fracturing on one side, top to bottom. Obvious the inclusions and most egregious fracturing must be cut out. Will not be able to remove all, or will have very small finished stone with unacceptable yield. Best use of "useable" stone shape is ~9.5 x 12 mm rectangular shape using lower than optimal angles without creating "windowed" stone.
- Mohs hardness = 5.5-6.5; RI = 1.68; critical angle = 36.5°
- **Optimum recovery plan:** ~9.5 x 12 x 7 mm using 38 vice 42° culet angle and crown angles lowered as required to cut below white table inclusion plus reduce girdle 3% thickness as required.
- **In process findings:** Parallel fractures on one side penetrate deeper than expected. Use rectangular configuration that is slightly narrower than 9.5 mm to avoid all inclusions and majority (vs. all) of the fractures. Note: I found when cutting into opaque white "cauliflower" shaped inclusions, none were solid as they appeared. Each opened up to reveal a hole in the stone. Also, when cutting on one axis (north/south), or on 96 and 48 index settings, the stone was "hard," cut slowly on 600 dia. lap and was essentially polished when cut was finished. However, when cutting on the east/west axis (24 and 72 Index settings) the material cut instantaneously to depth like soft butter. The finish was opaque "silky" texture. Needs extreme care and light touch to avoid cutting below facet "meets."
- **Finished size, weight:** 9.2 x 12.2 x 7.0 mm; 6.5 ct (20.4% yield)
- **Cutting, polishing characteristics:** Used 50k Dia. with thin Linde A slurry on pavilion. The N/S (hard) facets polished readily but the softer E/W facets tended to scratch easily and took much time/patience to remove recurring scratches without cutting below "meets." Some tendency to abrade some facet edges, especially when hard N/S facets met softer E/W facets. Took time and patience to get edges sharp where this occurred. Used chrome oxide Mylar on crown facets.

N/S facets polished readily without incident. However, whereas E/W pavilion facets polished readily with Dia./Linde A but had scratching problem, had tough time getting opaque “silky” surfaces to polish *at all* with chrome oxide. After much time, would often have polished surface with some miniscule “pitting” that took much more time to eliminate. Luckily, no scratching phenomena on E/W facets like Dia./Linde A caused. Also did not experience abraded facet edges using the chrome oxide.

- **Cut, color, clarity and reflective characteristics:** Used Jeff Graham’s 89 facet rectangular cushion “Signature #3” design. Color is medium-dark green, identical to some Nigerian tourmaline I recently cut. Regarding clarity, the stone is clear, not “sleepy” or muddy. However, there are two flaws in the stone, neither of which are a significant detraction. One flaw breaches the table: small tight fractures that trailed the white inclusion that was removed. They go to about  $\frac{3}{4}$  mm below the surface and would have required significant stone down-sizing to remove. As it was, cut crown  $6^\circ$  below optimum angles to obtain this size stone. Also, did not have sufficient stone depth to cut culet to “point,” so polished flat facet parallel to table on culet tip about the diameter of a straight pin. (“Tipped” the stone like many faceters do to avoid chipping when setting – but in my case, I didn’t have the stone available to cut a sharp point and retain the targeted stone L/W size.) Also, there is a fracture remnant at the girdle on one corner which extends into the stone about  $\frac{3}{4}$  mm. Not very noticeable and would have required significant down-size to eliminate. Reflection off of pavilion is okay, but would have been better if  $1-2^\circ$  were added to pavilion and  $5-6^\circ$  were added to the crown. The price of maximizing yield, but still a nice stone. (Observation also gleaned from cutting several Russian chrome diopsides using various angles within the “workable” pavilion/crown angle ranges.)

#### **Diopside – Madagascar:** (#2 of 2 pieces)

- **Rough material weight:** 20.45 ct
- **Equipment used:** Fac-ETTE Gem Master 2
- **Size, shape, clarity, etc. – Initial assessment:** Flattest side up presents roughly a triangle shape; material is clear/clean on upper portion of stone from this perspective, with numerous vertical fractures radiating from “culet” area towards girdle area. One vertical fracture radiates from one side into body of stone, approximately the area where girdle will be placed. Appears tight and possibly stable. Some small white “cauliflower” inclusions scattered throughout the stone, mostly in lower pavilion area, some upper peripheral pavilion area. May not be able to avoid all in finished stone. Best use stone shape is equal sided trilliant configuration.
- Mohs hardness = 5.5-6.5; RI = 1.68; critical angle  $36.5^\circ$
- **Optimum recovery plan:** Use step-cut radiant trilliant design. Cut three “steps” (add two optional) in pavilion for additional scintillation and maximum carat weight recovery. Cut four (vs. three) steps on crown. Use  $42^\circ$  culet and  $40^\circ$  crown mains for maximum reflection off of pavilion and maximum carat weight. Target 12 mm stone.

- **In process findings:** Major fracturing in lower pavilion area crumbles with application of 360 lap at any speed. Fractures travel. 600 lap works okay at low speed (20-25%), however this piece abrades at each of the three corner intersects between the three trilliant sides from girdle to culet. All speed ranges used without success. Lost stone depth dealing with this. This stone reacting just like kunzite – except it is doing that on all planes, not just a “cleavage plane” – a problem which this material shouldn’t have. The only time I have run into this issue with material that shouldn’t exhibit this characteristic is material with “impression” fractures due to use of explosives during the mining process. Was forced to revert to all faceting with slow speed using 1200 Dia. lap – extremely time consuming – labor intensive to salvage this stone.
- **Revised cutting plan:** Stone loss requires reversion to one row vs. three steps in pavilion configuration plus reduce culet angle from 42 to 39°. Also, reduce crown from four to three “steps” and reduce “main” angle from 40 to 36°. Reduce depth of each “step” as required to meet minimal girdle to table depth.
- **Finished size, weight:** 12 x 12 mm x 7mm, 5.93 ct (29.24% yield)
- **Cutting, polishing characteristics:** Cutting issues noted above. Also, extreme difference in hardness and cutting/polishing speed at opposing axes noted same as noted for the diopside above. Used chrome oxide to polish. No scratching or corner abrading issues as noted when 50k Dia. was used with or without Linde A.
- **Cut, color, clarity, reflective characteristics:** Used 106 facet step-cut trilliant configuration that is an old favorite – not sure who originated the design. Deep green color looks much like tourmaline. Stone is eye clean except for one ~0.25 mm white “cauliflower” inclusion just under the pavilion surface about midway between the girdle and culet tip. Reflection off of pavilion passable but would have been better if original angles and step configuration could have been accomplished.