

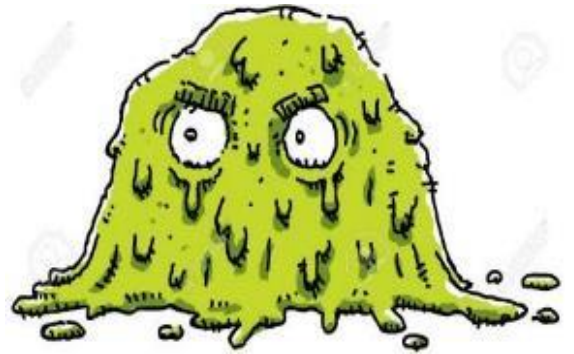
APRIL 2022

DIARY

April	2	10:00–14:00	Open to the Public Day – Rocks, gems, jewellery, mineral specimens to look at, chat about, swap, sell, or buy. MASKS MUST BE WORN IN THE CLUBHOUSE
	15–18		EASTER WEEKEND
	23		Introduction to Lapidary and Workshop Etiquette course
May	7	10:00–14:00	Open to the Public Day – Rocks, gems, jewellery, mineral specimens to look at, chat about, swap, sell or buy. MASKS MUST BE WORN IN THE CLUBHOUSE

Did you know that Africa is sitting on a large blob in the mantle?

There is a smaller one beneath the Pacific Ocean but I don't think anyone is sitting on that one, although they might be sailing over it. They have been detected by seismic waves and are termed Low Shear Velocity Provinces or LSVPs. The African blob is lighter, and thus more unstable, and shallower than the Pacific one. It is situated about 1 000 km below surface and is moving upwards at about 2 cm year. It may have caused uplift and volcanism a hundred or so million years ago and may do so again a long time into the future, depending on how it evolves as it rises into areas of lower temperature and pressure. Researchers are not sure what these blobs are composed of, with theories ranging from an iron-rich phase to an accumulation of subducted oceanic crust, and plenty more no doubt. I won't end with 'watch this space' as that will be worse than watching paint dry so perhaps just dial in from wherever you are in the cosmos in 50 million year's-time or so and get an update from whoever is Club Secretary. **PR**



Uranium: From Colourful Secondary Minerals to Yellow Cake and from Reactors to Weapons

By Peter Rosewarne

Introduction

My last article in February started with a big bang; this one ends with one. Welcome to *Uranium*, unstable, radioactive element number 92 in the Periodic Table. We'll concentrate on the mineralogical aspects as this is a mineralogical forum and just touch on some interesting (trust me!) facts relating to nuclear reactors and weapons. First, as usual, some technical stuff but if you aren't interested, go straight to Minerals but don't collect R200.

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Technical Information

Uranium (U) was discovered by Martin Klaproth in 1789 and named after the then recently discovered planet Uranus. The most common *isotope*¹ of uranium is U238 (99.3%) and then U235 (0.7%). Uranium is 40 times more common than *silver* and is more common than *gold* in the Earth's crust and ranks 48th amongst the most abundant elements. Those facts surprised me and possibly you too. Although associated with radioactivity, its rate of decay is so low that it is not one of the more radioactive elements. The isotope U238 has a half-life of 4.5 billion years and U235, 704 million years. Uranium eventually decays to the stable element *lead*.

Some minerals containing U are subject to what is called *metamictal decay*. In this process, although the external crystal form remains unchanged, the internal structure is damaged by radiation. These minerals gradually become opaque, then black with a glassy amorphous structure and their cleavage disappears (Ďuda and Rejl, 1986).

The main producers of U are Canada, Australia, Russia, Namibia and Kazakhstan. Mining is by conventional open pits, heap leaching and *in-situ* leaching. Heat generated from the radioactivity of U, *thorium* and *potassium* in the crust and mantle of the Earth generates a heat flow of 10.6×10^{24} MJ². Compare this with the energy consumed for electricity generation worldwide of 6.4×10^{13} MJ in 2011 (Tuniz, 2012). Radioactivity is everywhere and if it produced sound, the noise would be unbearable.

Minerals

Primary U minerals such as *uraninite*, UO₂, (formerly known as *pitchblende*) and *coffinite*, U(SiO₄).nH₂O, are drab and often disseminated as grains rather than occurring as distinct crystals. There are exceptions, including this "best of" specimen of uraninite from the Shinkolobwe Mine in the Democratic Republic of Congo (DRC) shown in **Figure 1**, now in the Canadian Museum of Natural History (image courtesy of Michael Bainbridge who kindly made his originals available for this article).



Figure 1: Uraninite, Shinkolobwe Mine, DRC

Contrastingly, secondary U minerals are among the most attractively coloured minerals known, coming in greens, oranges, yellows and reds, and they also fluoresce. The chemical formulae for most of these secondary minerals are a bit tortuous and are not given here. Suffice to say that the green ones contain copper and they are mostly phosphates, arsenates and vanadates.

Apart from the more common minerals such as *boltwoodite*, *torbernite* and *autunite*, many of these colourful minerals have tongue-twisting spellings such as *cuprosklodowskite*, *becquerelite* and *mounanaite* or try *tyuyamunite*. Who knew that the first-named mineral and *sklodowskiite* are named after Marie Curie whose middle name was Sklodowski? She carried out much of the early pioneering work on radiation and won the 1903 Nobel Prize for Physics (with her husband Pierre and Henri Becquerel) for this work. She received a second prize in chemistry in 1911. However, excessive exposure to radiation ended up killing her prematurely in 1934.

Renowned Canadian collector, the late Bill Pinch, assembled an unrivalled collection of radioactive minerals, which are showcased in Bainbridge (2020). Some photographs of his specimens (now in the Canadian Museum of Nature collection) are reproduced in **Figures 2 to 7** courtesy of Michael Bainbridge, who kindly made available his original photograph files. These show *cuprosklodowskite*, *soddyite* (sounds like the mineral name that would come to mind after you've just dropped a prized specimen?), *torbernite*, *metatorbernite*, *boltwoodite* and *francevillite/mounanaite*.

¹ Two or more forms of the same element in which there are additional neutrons in the nucleus. U238 has 140 instead of 98, hence its atomic number of 238.

² Million joules



Figure 2: Cuprosklodowskite, Shinkolobwe Mine, DRC



Figure 3: Torbernite, Shinkolobwe Mine, DRC



Figure 4a: Soddyite (yellow) and Cuprosklodowskite (green)

Figure 4b below: Detail of Figure 4a



Figure 5a: Boltwoodite, Goanikontes, Namibia

Figure 5b right: Detail from Figure 5a





Figure 6: Francevillite (orange) and Mounanaite (yellow), Franceville, Gabon

The March-April issue of the Mineralogical Record had an interesting note on meta-autunite and metatorbernite (Mineralogical Record, 2020). Autunite and torbernite transform at room conditions by losing some of their water and are then termed *meta-*. In doing so they go from lustrous to dull crystals and in the case of autunite, they disintegrate. However, it was long thought that torbernite from the Shinkolobwe (caterpillar in Swahili) Mine was stable as the crystals retained their lovely lustrous, transparent green colour. Recent x-ray diffraction work has however shown that even these beautiful crystals are in fact metatorbernite. An example of metatorbernite on torbernite (?) from the Musonoi Mine is shown in **Figure 7**.



Figure 7: Metatorbernite (light green) on Torbernite (dark green), Musonoi Mine

Pinch tells a story of mine management visiting the Shinkolobwe Mine (more on this mine later) and being shown a vault filled with world-class U mineral specimens. Apparently, they promptly ordered them to be taken to the crusher and a mineral dealer who was fortunately present followed the wheelbarrows on their way and rescued as many specimens as he could stuff into his pockets, among them the uraninite specimen in **Figure 1**.

There are a surprising number of entries in 50 Years of What's New in Minerals (Mineral Record, 2020) under U minerals including for uraninite, *uranophane*, torbernite, metatorbernite, autunite and cuprosklodowskite, mostly from the DRC but also European and USA localities. A lovely boltwoodite from the Rössing Mine, Namibia, on sale at the Springfield Show of 1997, is shown in **Figure 8** (from The Mineralogical Record, 2020).



Figure 8: Boltwoodite from Rössing Mine Mines

My association with U goes back to 1975 when I had just arrived in South Africa from the UK and was doing geological mapping in the Great Karoo between Merwerville (just my luck; one of only two 'dry' towns in the country at that time) and Beaufort West. There was heightened interest in U world-wide at the time due to a surge in the building of nuclear power plants, including our very own Koeberg Nuclear Power Station (KNPS), and a favourable price for U. Companies such as US Steel, Esso, Southern Sphere and Union Carbide had claims or options and geologists all over the area. Farmers would often drop off rocks at my camp with green and yellow mineralisation. Esso established a trial underground mine on the so-called Ryst Kuil prospect southeast of Beaufort West in 1978/79. This is a low grade (c.1 300 ppm U_3O_8) channel sandstone deposit that trends northeast-southwest over about 50 km (Figure 9). The map is a bit small to read names off of but the mauve line demarks the Ryst Kuil area and the brown one the adjacent Rietkuil area. The mauve shaded areas are the main ore bodies.

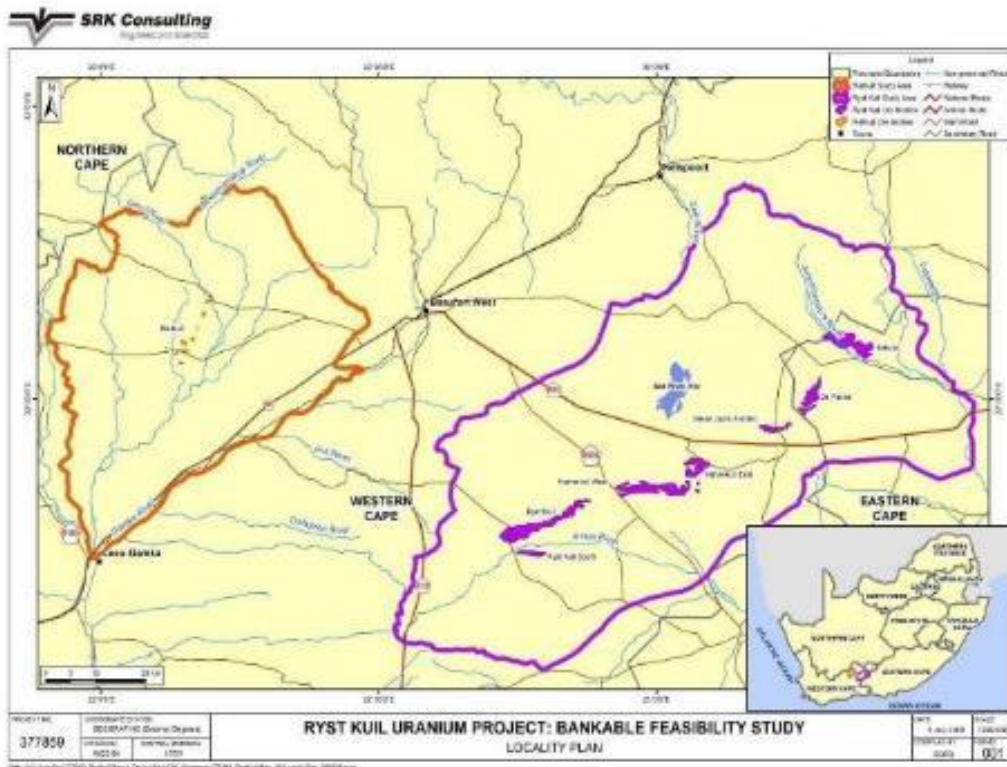


Figure 9: Locality Map for the Ryst Kuil and Rietkuil Uranium Prospects

The remains of the mine surface infrastructure are still standing along with the access decline (Figure 10). A radiation counter is shown on a piece of exposed ore rock in Figure 11 showing 7 583 counts per second.



Figure 10: Trial Mine Decline Entrance on the Ryst Kuil Prospect



Figure 11: Radiation Counter on a Piece of Ryst Kuil Uranium Host Sandstone

The main minerals here are uninteresting from the collector's perspective, being uraninite and coffinite. They were deposited by circulating groundwater containing U enrichment from a possible volcanic or granitic source, when it encountered reducing conditions. These may have been related to dead and decaying vegetation as the ore is often associated with plant remains. An example of the Ryst Kuil type of ore is shown in Figure 12. *Molybdenum* is an accessory element.



Figure 12: Typical Ryst Kuil Uranium Ore

Interest picked up again in 2007 when a junior mining company called UraMin rekindled exploration work in the area and yours truly carried out extensive groundwater investigations as the channel sandstone turned out to not only host U mineralisation but a major aquifer too. Areva took over the prospect but interest fizzled out again with a drop in the U ore price. Tasman Pacific Minerals took up the challenge in 2015 and I co-authored a number of reports on groundwater for Environmental Impact Assessments (EIA) for the various sub-prospects (SRK, 2016). A series of open pits were planned, and vehemently opposed by many locals, but the project again proved to be stillborn with the then low U price and drop-off in planned nuclear reactors causing its demise rather than public opinion.



The ore is processed into a product called 'yellow cake' which is U_3O_8 (Figure 13). However, modern refining processes are more efficient nowadays apparently and yellow cake is more commonly brown in colour.

Figure 13: Yellow Cake

Namibia has some of the largest reserves of U but processing of the ore requires a lot of water which Namibia is deficient in and so the ore bodies are largely untapped, with one very large exception at Rössing. A sea water desalination plant was built near Walvis Bay and water piped to the Trekkopie mine some 50 km inland from Swakopmund, which is now mothballed. The host rocks range from *alaskites*³ at Rössing to *calcretes* at Langer Heinrich and Trekkopie.

The Musonoi Mine in the DRC has 31 identified U minerals and has produced the World's best torbernite and cuprosklodowskite specimens, examples of which are shown in Figures 14 and 15. Half of an issue of The Mineralogical Record was devoted to this mine in 2018 (Mineralogical Record, 2018) and there are some stunning specimens shown (Figures 14 and 15 are photographs of photographs in this issue). The host rock is dolomite in a structurally disturbed area near the western end of the Katanga Copperbelt.

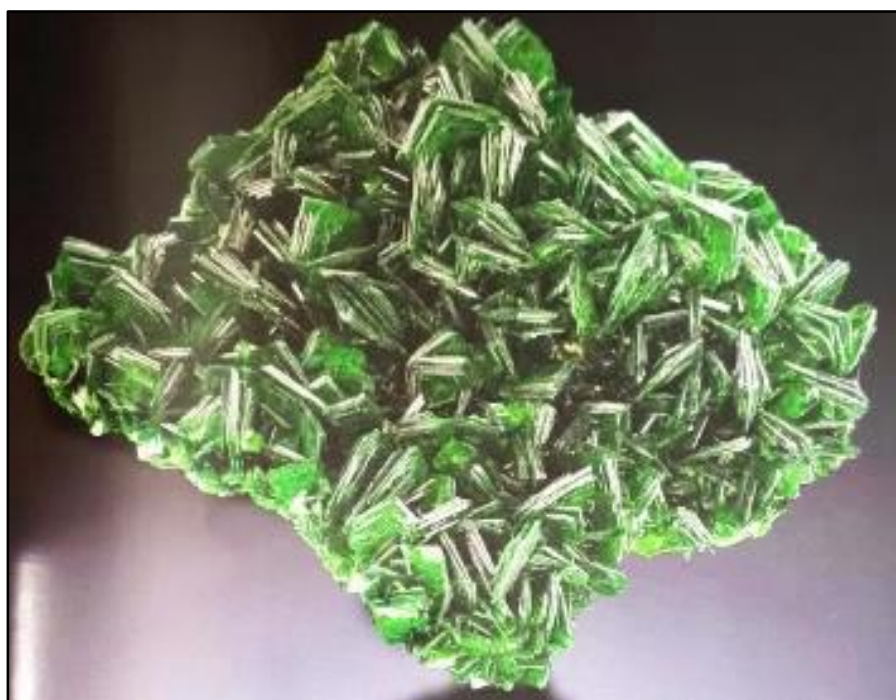


Figure 14: Torbernite, Musonoi Mine (Steve Smale collection)

³ Leucocratic, alkali-rich granites with few dark minerals



Figure 15: Cuprosklodowskite, Musonoi Mine

Uranium occurs in the gold-bearing conglomerates of the Witwatersrand, mainly as uraninite, and is particularly concentrated where *carbon* is present, as in the Carbon Leader Reef. About 130 000 t of uranium oxide have been exported from this source as of 1995 (Cairncross & Dixon, 1995). A university study has estimated that there are 600 000 t of U contained in the dumps surrounding Johannesburg and Prof. Anthony Turton says it is the most radioactive city in the World. An example of a *pyrite*-rich Witwatersrand conglomerate is shown in **Figure 16**.

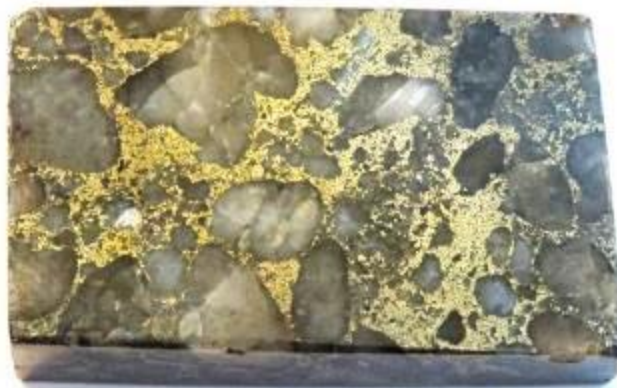


Figure 16: Example of pyrite-rich Witwatersrand Conglomerate (obtained from Rob Smith)

Nuclear Reactors

We all know, or think we do, that KNPS is the first and only nuclear power station to be built on the African continent. However, scientists have discovered that, about 1.7 billion years ago, a natural nuclear reactor was operating in what is now Gabon. Groundwater apparently flooded a U ore body and caused it to reach critical mass and function as a nuclear reactor. The heat generated evaporated off the groundwater and stopped the nuclear reactions but subsequent re-floodings resulted in reactivation of this process on 16 occasions. The sequence was only ended when the ore was depleted of U235 to below the concentration required to support the chain reaction. This natural process couldn't happen again because U235 has decayed naturally to below the percentage concentration required to generate such a reaction.

I co-authored a report on groundwater at KNPS/Duynefontein and its surrounds in support of an EIA for Nuclear-1, the next-generation of nuclear reactors as part of the government's on-off nuclear programme, which was approved by the regulatory authorities (SRK, 2010).

Nuclear Weapons

Ever wondered what they are talking about when 'depleted' U is mentioned in a military context? I have and thanks to *Wikipedia* it apparently refers to U depleted in the U235 isotope during the enrichment process for nuclear fuel and weapons. Due to its high density, it is used in armour-piercing shells, for example.

Here is an interesting fact to finish up with, appropriately because a nuclear war could see the extinction of the human race, or at least, life as we know it. A sort of Big Bang (possibly hundreds) in reverse.

Did you know that the uranium for the *Manhattan Project*, the secret project that oversaw the development of the World's first nuclear bombs between 1942-45, came from the Shinkolobwe Mine, Katanga Province of the DRC? The ores here apparently have the highest concentration of U of any ore bodies in the world at 3.1%; most are <1%. This concentration was required to enable the enrichment of the U to the required concentration to reach 'critical mass' and achieve a chain reaction of atom splitting neutrons when a conventional explosive fired a cylinder of U235 into the bomb's main mass of U235 at 1 900 feet above Hiroshima at 08:15:43 local time on 6 August 1945 (**Figure 17**). Lower concentration ore can now be used because of better enrichment processes. The Shinkolobwe Mine officially closed in 2004.



Figure 17: Mushroom Cloud over Hiroshima August 6, 1945

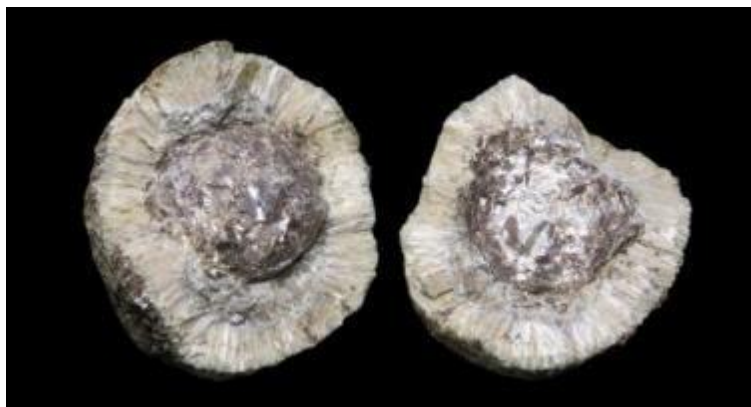
A sobering end to this article on uranium, its minerals and some uses. I sincerely hope that the engineers overseeing the 2022 upgrade and life extension of KNPS know more about their jobs and are using better materials than seems to be the case with Eskom's Kusile coal-fired power station.

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From the Cabinet of Curiosities

This month's curiosity is a **Heřmanov Sphere**, a reaction nodule formed at the contact of serpentinite with pegmatite at Heřmanov in the Czech Republic. They comprise of an outer layer, or reaction rim, of anthophyllite, a magnesium amphibole, surrounding an internal ball of phlogopite, a magnesium mica. The example specimen is a 6 cm sphere, shown complete and as two matching halves. PR



Describe your own original curiosity and send it to us with a photo.

Facetips

Faceting another softy - Barite. This one was hard!

After faceting several other soft stones – cuprite, cerussite, fluorite – I decided to tackle barite, barium sulphate (BaSO_4). It has a hardness of 3-3½ and two directions of easy cleavage, as well as being brittle and very heat-sensitive. These characteristics conspire to make it one of the more notoriously difficult materials to facet. After several attempts I managed to produce a nearly acceptable stone. The first experiment was with a very included crystal, testing various combinations of polishing lap and medium, and settling on polishing with 100 000 mesh diamond on a Gearloose Lightside lap, with WD40 as a lubricant. This gave me the confidence to cut my second largest piece of rough, which was supposed to become an approximately 25 ct stone. The pavilion cut and polished successfully, but after transfer I stupidly used a hot blade to remove adhering wax, and the stone cracked spectacularly. My confidence was dented, so the third attempt was with a smaller piece of rough. After transfer, that one came off the dop, skittered about on the lap, and chipped two corners. So I put it aside for a few days until deciding to recut the whole stone 'from scratch' as an experiment, dopping with epoxy rather than superglue. For soft stones until now I have used a hybrid dopping system of wax indented with a suitably shaped 'anti-dop' to make an impression, followed by superglue. This attempt was more successful, right up to polishing the final crown facet before the table, when it sprang several parallel cleavage cracks. I think the narrow facet got too hot on the nearly dry lap. I tried polishing them out, but it only made them worse. So there was nothing to do but polish the table and accept the blemished stone. You can see the cleavage cracks looking like scratches on the left-hand edge of the table in the accompanying photograph. (In the hand you don't notice the colour banding in the stone.) DM



Barite, 10 × 8 mm, 5.38 ct, rough from Mt Brukkaros in Namibia

FACET CUTTING LAPS

Duncan Miller

Introduction

'Cutting' facets is really a grinding operation where diamonds embedded in flat discs or 'laps' do the work of removing material from the gem rough. There are three types of facet cutting laps available. These are electroplated or bonded laps, solid metal laps, and sintered bronze laps – all available in six inch and eight inch diameter versions. This article describes the properties of the various laps in these three categories.

Diamond grit

All three types of laps are designed to hold diamond grit to provide an abrasive surface. Laps are available with various different diamond size abrasives. Two different measurements are used to describe diamond abrasives, whether as loose powder, or in a paste, or already embedded in a lap. 'Mesh' is related to standard sieve sizes while 'micron' describes the mean diamond size. The relationship between mesh and micron is tabulated and illustrated graphically in Figure 1.

Grit size (mesh)	Size range (micron)	Grade number (micron)
230	54–80	60
600	22-36	30
1200	12-22	15
1800	8-12	9
3000	4-8	6
8000	2-4	3
14 000	0-2	1
50 000	0-1	1/2
100 000	0-1/4	less than 1/4

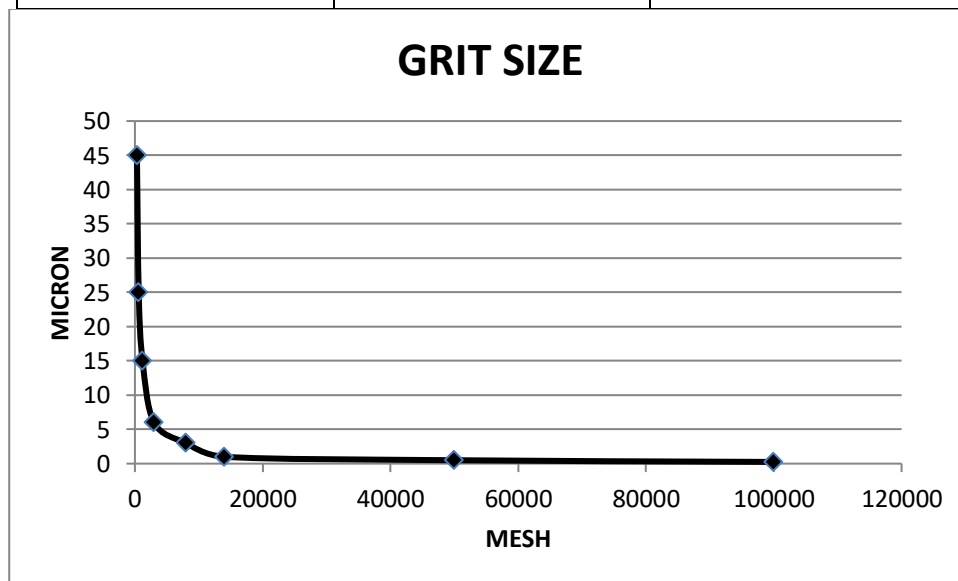


Figure 1. The relationship between mesh and micron grit sizes

As you can see from the graph the relationship between mesh and micron grit sizes is not linear. For faceting it doesn't matter which scale is used, as long as you understand the relationship between them. With the mesh scale, higher numbers mean finer grit. With the micron scale lower numbers mean finer grit.

Diamond grits also come in different varieties. There are natural grits, produced by crushing mined diamond crystals. These are sharp and splintery. There are blocky synthetics, usually with a cubo-octahedral shape (Figure 2). These are the most commonly used grits in grinding laps because of their more regular shape. There are also 'friable' diamond synthetics, which consist of aggregates of much smaller particles. These break down quite quickly to finer sizes with use and can be useful in polishing.

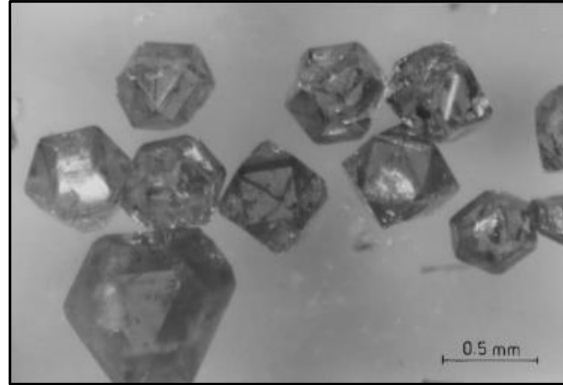


Figure 2. Cubo-octahedral synthetic diamond crystals

Electroplated or bonded laps

There is a wide variety of bonded laps available. They all rely on an electroplated layer of metal, usually nickel, to hold the diamond grit on the surface. The thickness of this electroplated layer varies with the size of the diamond grit, so the finer grits are held in a very thin layer. There is a wide range of prices too. Solid steel laps are sturdy and flat. So-called 'toppers' or top plates are thin. Some have adhesive backs to glue them down to a solid lap. Others simply have a protective copper backing to inhibit corrosion. The loose toppers tend not to be very flat and particularly the larger eight inch diameter ones suffer from flutter or run-out near the outer edge. This can produce uneven or domed facets. There are discs with the diamonds bonded in rippled or dotted patterns that are intended to remove bulk material quickly.

Electroplated laps are convenient to use and they are relatively inexpensive. This accounts for their popularity with hobby cutters. They are fine if you are just starting out, or don't intend cutting very numerous or very large stones. They have some drawbacks. The finer grits, like 3000# have such thin electroplated layers, that they are prone to damage by sharp facet edges or corners. Some of them simply peel and shed fragments of diamond-coated metal, causing deep scratches. The coarser grit laps start out cutting very rapidly because the exposed diamond points are sharp. As the points develop wear flats the cutting action slows down and you have to use increasing force to remove material. All of them are susceptible to clogging, especially if you are cutting quartz. They can be cleaned with a mild abrasive, but abrasion risks damaging or even removing the electroplated bonded surface. Sometimes blunt electroplated laps can be rejuvenated a bit by carefully grinding a soft abrasive silicon carbide stick, but this usually destroys the surface of the lap. When they are worn out or damaged you simply have to discard and replace them. For these reasons many faceters do not use bonded laps.

Solid metal laps

Traditional faceting laps were solid copper laps and they seem to be coming back into more regular use again. These are simply solid copper discs, about 5 mm thick for stability, machined flat and parallel on both sides. Some manufacturers partially anneal the copper discs to produce a softer matrix for the diamond particles. A different lap is used for each different grit size. Diamond powder can be mixed with a light oil carrier or even Vaseline and spread on the lap surface. Nowadays diamond grits are available in formulated pastes, in an oil-based or water-based carrier in syringes or cylindrical 'lipsticks'. Some of these need suitable dilution, others don't. The only practical differences between the two carriers is that the water-based ones tend to dry out but using them makes it is easier to wash any excess grit off the lap after charging.

The copper laps need initial charging and repeated recharging when they start cutting slowly or when copper is rubbed off on the stone. The diamond paste is spread evenly over the lap surface with a clean finger. Then a dedicated roller (a 1 cm roller bearing on a dowel works fine) or piece of synthetic corundum is used to work the grit particles into the metal. With coarse grit laps this is best done away from the faceting machine. With finer grits it can be done on the slowly rotating machine. With the finest grits there is no need to embed the diamonds before cutting. The pressure on the facets does the job. When charging a suite of laps it makes sense to start with the finest grit size first. That way you don't risk contaminating the finer laps with coarse grit. When the charging operation is finished the laps must be washed to remove any loose diamond that may lead to contamination.

Metals other than copper can be used. A hard tin alloy (Batt), brass, bronze and zinc laps are available for use as rechargeable cutting laps. With harder laps like zinc, the diamonds do not embed as easily or deeply as in copper and this produces a very aggressive surface more suitable for pre-polishing with the finer diamond grits. Loose coarse diamond grit on a lap is not desirable. Not only does this lead to a risk of contamination of finer laps, but diamonds rolling between the stone and the metal can abrade the softer metal rather than the stone, leading to rapid wear of the lap. All grinding laps need to be used with an even sweeping motion across the full width of the lap, to maintain even wear and a flat surface. Bumpy or uneven metal grinding laps need to be resurfaced by lathe machining. Machinists generally do not like doing this because the diamond particles destroy their cutting tools.

Solid metal laps require sensible care. They need to be scrubbed clean of swarf after use and stored separately, not stacked upon each other. Sturdy plastic bags or lap boxes can help prevent contamination. They should not be dropped because they may bend. Laps and their containers need to be labelled clearly so that grit sizes are not muddled. A fine grit lap can be downgraded to a coarser one, but not the other way around. The fear of contamination by loose diamond puts many people off using rechargeable laps, but with sensible care contamination isn't a problem; and a contaminated lap can be re-machined. The advantages of using solid metal laps are that they can be recharged to produce even, rapid cutting and that when the diamonds wear the laps don't have to be replaced.

Sintered bronze laps

Sintered bronze laps are the professional's choice of grinding laps, despite their expense. Typically they consist of a 3,5 mm thick layer of bronze containing a specific mesh size of diamond, sintered onto a steel base. These laps have a very long lifetime and can be rejuvenated easily by 'dressing' with an abrasive stick when the grinding action slows down or if they get clogged with swarf. They are dressed by grinding the abrasive stick with the lap rotating in the direction of intended use. They are sold dressed in a particular direction. In practice this makes no difference because the dressing direction can be changed easily. The dressing wears away some of the bronze, exposing fresh diamond points, supported by a comet tail of metal behind them (Figure 3).

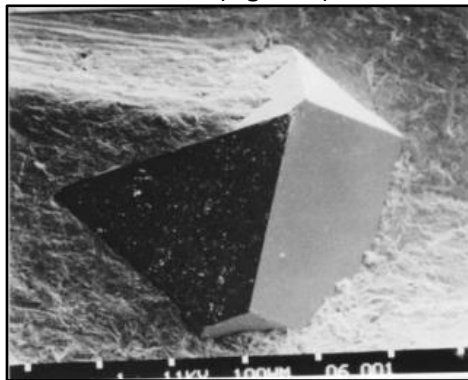


Figure 3. A newly exposed diamond point in a sintered bronze matrix

Sintered laps need very little maintenance apart from a scrub to remove swarf after use and occasional dressing. They cut evenly and quickly, there is negligible risk of contamination, and they last 'forever'.

What grinding laps do you need?

What you need depends on what machine you have, what you want to cut and how frequently. Six inch laps cost less than eight inch ones, but the larger laps have twice the surface area so can accommodate larger stones. Some faceting machines can only use six inch laps. If you are starting out, intend to cut only a few stones a month and do not want to cut doorknobs out of quartz, then a set of electroplated laps will do. You will need coarse, medium and fine grinding laps; say 325 mesh, 600 mesh and 1200 mesh. Avoid the temptation to buy a 3000 mesh bonded lap. It simply won't last. The 325 and 600 mesh laps can be toppers. If possible, buy a solid steel 1200 mesh lap for fine cutting because it will be flat.

When this set of laps wears out, you may want to replace it with a set of copper laps (and rollers or synthetic corundum burnishers). Here 325 mesh, 600 mesh and 3000 mesh are recommended. For some unknown reason the 1200 mesh diamond has a nasty habit of producing an irregular 'orange peel' surface on harder stones like sapphire, and with a solid copper 3000 mesh lap you can avoid this problem.

If you have deep pockets, are self-indulgent, or intend cutting professionally then you should invest in one or more sintered bronze laps. They come in a range of mesh sizes, from around 220 mesh to 3000 mesh. If you can only afford one, the 600 mesh is the most useful. A full set will cost you almost as much as a new faceting machine!

Pre-polishing laps

There is no fixed boundary between grinding and pre-polishing laps. The grinding behaviour of any particular lap cuts depends not only on the diamond mesh size, but also the actual size distribution, the density of particles exposed on the lap surface, their condition (sharp or worn), and the metal matrix itself. For example, a zinc lap charged with 3000 mesh will cut as vigorously as a new 1200 mesh topper. Whether you need a pre-polishing step or not depends on the finish produced by your fine cutting lap. Depending on the material and size of the stone, sometimes you can go straight from 600 mesh to polishing. Often 1200 mesh will be a sufficient pre-polish, especially with stones of moderate hardness. With harder materials like corundum, 3000 mesh or 8000 mesh on solid metal laps may be necessary for pre-polishing, unless you want to spend ages trying to polish out scratches and sub-surface damage produced by a coarser laps.

Various dual finishing laps are available now, with a pre-polish band on the outside and a polishing band on the inside. Some of these require only water as a lubricant with no added abrasive, while others depend on using diamond paste of two different grades (and carefully avoiding contamination of the inner band). There has been a rapid development of these laps and other speciality polishing laps, which can be ordered from Gearloose (<https://gearloose.co/>).

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Miller, D. 2014. Facet cutting laps: Part 2. *Southern African Gems and Minerals* 46(1):3-5.]

Lapidary News

It's been a while since we last had a sphere course, so it filled quickly with eager participants. The photo titles tell the story.



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