

Five Dopping Methods

For Use in Faceting Gemstones

Articles by Members of
Columbia-Willamette Faceters' Guild:

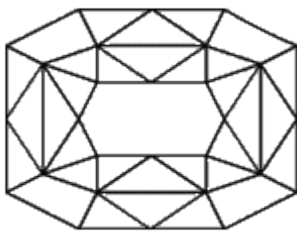
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Resources listed:

Devcon 5-Minute Epoxy, available at Tap Plastics and some hardware stores.

Raytech brown wax and Diamond Dop wax available at The Facet Shoppe, www.gemcutter.com

Dopping wax from India: Ramrock Supplies 42961 Green Mountain Drive, Lebanon, OR 97355. 541-451-3649.

Loctite 409 Superbonder Industrial Grade Gel \$40904, 3-gram tube. R.S. Hughes Co, Portland, OR, 503-289-6715.
www.rshughes.com.

Do-it Best brand #387061 epoxy paste. Available at W.C. Winks Hardware in Portland, OR or check www.doitbest.com for a dealer near you.

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(Editor's Note: This booklet was written and published in 2009. Some sources and products may have changed or be unavailable now in 2018.)

Using epoxies (that is, two-part resin cements), the faceter needs to be careful to use the correct cement. Some of the quick setting epoxies do not become completely hard and tend to remain slightly flexible. This should be avoided. You need as much rigidity as possible. If you dop in a room with high humidity, like the utility room near the dryer vent, there is a pretty good chance that your efforts to dop with epoxy may result in rubbery or insufficiently rigid epoxy. Make every effort to use epoxy in a warm, dry area for best results.

One of the best cements to use in dopping is Devcon 5-Minute Epoxy. The Devcon epoxy is available in two separate tubes and also in a syringe. Do not use the syringe pack. It is difficult to get two small drops that are equal in size; which is necessary to get a proper cure. The user will waste less cement with the separate tubes than the syringe.

When the chemical reaction between the resin and hardener takes place, the mixture can be runny. Most cutters find it advantageous to add a filler to the epoxy, such as cornstarch or tumbling grade cerium oxide, to thicken the epoxy and keep it in place.

One of the best features of epoxy is that it is waterproof and resists shearing. I have never had a stone come off when dopped carefully with epoxy.

When choosing the dop, I have found that the cone dops make a much better base for epoxy dopping than the flat top dops, because the epoxy does not work as a thin film adhesive. More mass is required to form a satisfactory bond for dopping.

Many faceters use epoxy for both the initial dopping and the transfer. Some use wax for the initial dopping and epoxy on the transfer. Although this article specifically describes the process using epoxy for both dopping procedures, I usually use wax for the initial dopping, as the stone can be pushed around a bit on the dop, if necessary. Also, sometimes when removing the first dop at transfer, the epoxy can get soft when heated and the stone can move a little. This is avoided if you use wax for the initial dopping as it melts at a much lower temperature than epoxy.

If you intend to facet amber or sulphur, dop with Elmer's Glue and soak in water to remove the stone from the dop. Facet really slow and with very little pressure.

Initial Dopping

1. Before you start, gather together all the supplies you will need. Supplies may include: transfer fixture, stone, cone-shaped dop, modeling clay and target dop, denatured or 99% isopropyl alcohol, plastic baggy, wooden stir stick (toothpick or coffee stirrer), Q-tip, DevCon two-part five-minute epoxy, and a lamp with 60-watt incandescent light bulb. Use relatively fresh epoxy; it has a shelf life of six months or less.



Fig.1 Grind a temporary table.

2. Grind a flat spot, or temporary table, on the stone, as this is where the dop will go. (fig.1)

3. Wash your stone and the business end of the dop with either Denatured Alcohol or 99% Isopropyl Alcohol to remove any trace of oil.

4. Place the target dop into the bottom part of your transfer fixture and place a generous blob of modeling clay on the dop. Stand the transfer fixture up on its end and put your clean, prepared dop into the upper end of it. Do NOT touch the business end of the dop. Now place your stone onto the modeling clay, with the flat, temporary table facing up. (fig. 2)

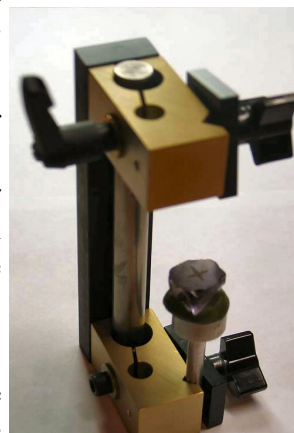


Fig. 2 Place stone on modeling clay on a large, flat dop in lower part of jig.

5. Slide the dop down onto the stone. This is to make sure that the flat end of the dop is flush with the ground flat on the stone and that the stone is centered. Adjust as necessary. Back the dop away from the stone. (fig. 3)

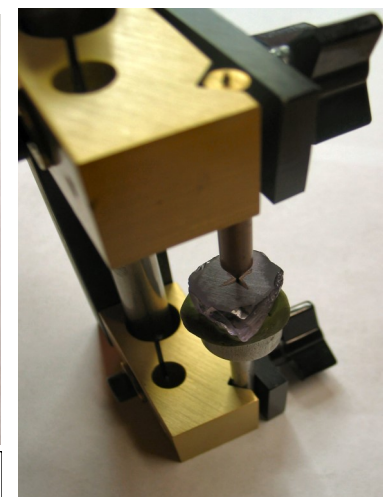


Fig. 3 Center stone in jig.

6. With the plastic sheet on which you are going to glue in front of you, squeeze one drop of each the resin and the hardener parts of the epoxy onto the sheet. Try very hard to make both drops the same size. This is important.
7. Put a generous amount of fresh cornstarch onto your mixed epoxy and stir this filler into the epoxy mix. You will reach a point where the mix is quite stiff, almost like whipped cream. Using your stirrer, place the mixed epoxy onto the flatly ground area of your stone and onto the end of the dop. Remember that you only have five minutes to do all of this before the epoxy starts to thicken.
8. Push the dop down onto the stone. Pick it up a little, and then put it down again. Using your stirrer, mold the epoxy mix onto the stone and dop to create a good fillet or cone to support the stone on the dop.
9. Depending on how stiff you have prepared your epoxy mix you may have to manipulate your transfer fixture in order to keep the still-fluid epoxy mix where it belongs. Rotating the transfer fixture while the glue solidifies may be necessary.
10. As soon as your epoxy stops moving you can put your transfer fixture onto a flat surface. If possible, place a gooseneck desk lamp with a 60-watt incandescent bulb as close to your epoxy joint as you can without touching either the gem or the epoxy. Wait about two hours before checking your job, then using a pin or needle, attempt to scratch the epoxy. If the point of the pin can be pushed into the epoxy, it is too soon. When you can scrape the pin across the surface of the epoxy without denting it you are just about ready to facet your stone. To be sure, try once more to push the pin into the epoxy. If it is indeed hard enough, get on with faceting your stone.

Transfer

After the pavilion is faceted, you will need to transfer the stone to another dop in order to cut the crown. Choose a dop that your culet will fit into, usually a cone dop, but on some cuts this will be a keel dop. Most of the procedure is the same as initial dopping.

1. Gather the necessary supplies, and clean both the stone and the business end of the receiving dop with either Denatured or 99% Isopropyl Alcohol. Do not touch any of the areas you have cleaned.
2. Place the stone/dop in the bottom of your transfer block (the part that does not move) and the new, receiving dop in the upper part of the transfer block (the moveable part). Gently push the new dop onto the stone to make sure it all fits and is aligned, then lift the dop up from the stone. (fig. 4)
3. Mix the two-part, five-minute epoxy as in Steps 6 and 7, above.
4. Using your stirrer, put a little epoxy on the culet of the stone. Some people recommend putting glue down into the cone of the dop as well, but this can cause the stone to lose its culet, so leave the very point of the pavilion without glue. Push the dops together, pull them apart and push them back together to get a good seat. Mold the epoxy around the stone and the dop to form a good fillet or cone, but be careful not to get epoxy up onto or over the girdle. Having glue on the girdle makes it more difficult to level the girdle after transfer. Rotate the transfer block as necessary to keep the glue in the right place until it thickens enough to stop running. (fig. 5)
5. Repeat Step 10 above and let your epoxy cure a sufficient time. Test with pin.
6. To remove the initial dop, my preference is an old-fashioned alcohol burner. The temperature is much lower than that of a butane torch. In order to ensure that the stone does not become overheated, you can wrap a piece of wet paper towel around the stone and the new dop. Then heat the shank of the dop you are going to remove. Do this from about a half inch away. If your fingers get hot, the heat source may be too close. Place just a BIT of sideways pressure on the dop when it is warm and the stone should release. Do not pull on the stone; you do not want to mess up the positioning.

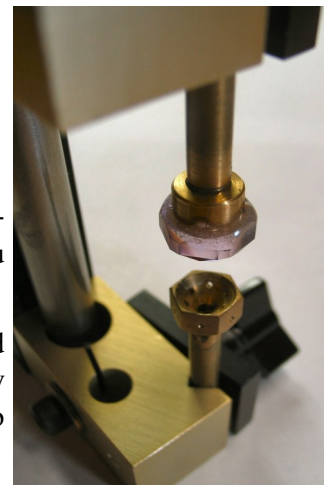


Fig. 4 Transfer position before gluing.

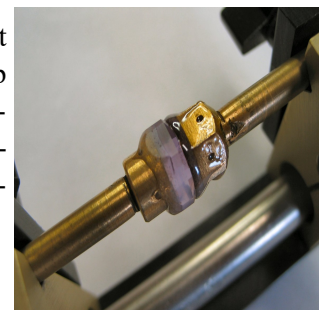


Fig. 5 Transfer, with fresh glue on right.

7. After you have finished cutting the crown, you use the same alcohol lamp method of heating to remove the stone from the final dop. Many faceters cut a piece of dowelling a couple of inches long and drill a ¼ inch hole down about an inch into the top. If you put the dop in this hole and hold the stone with a wet paper towel, then heat the dop with the alcohol lamp, the weight of the dowel can help the stone release. You can also add a little bit of sideways pressure to the stone while holding the dowel in your hand (keeps your fingers from burning on hot dops) to release the stone. Do NOT pull on the stone and be careful not to leave the pointy end in the bottom of the dop's cone. (fig. 6)

8. Most of the epoxy can be removed gently with your thumbnail. You can gently set the stone into a sealed jar of acetone or alcohol to dissolve any remaining glue. Leaving it in a sealed jar of acetone overnight also cleans the dop, but don't keep the dops and stone in the same jar.



(Fig. 6) Removing initial dop with alcohol lamp. Stone and fingers protected by wet toweling on stone.

Cold Dopping with Wax and Super Glue By Jim Hoeschen

The following article is a summation of both my experience with cold dopping and that of other faceters. It covers one method of cold dopping incorporating faceting dop wax and superglue. While this is not the only way to cold dop, it is a method that works and you should consider adding to your skills portfolio. For heat-sensitive stones cold dopping is the safest choice to protect your stone from damage caused by exposure to increased temperatures.

Use of the wax-only method to dop stones for faceting has both pros and cons. It takes a while to learn the technique, but once you 'get it' you will find it is quick and easy and lets you start faceting sooner. If you use wax to dop and the stone is a little off-center, you can heat it a bit, soften the wax, and slightly reposition the stone. The downside is that you can also accidentally soften the wax and have the stone slip when you don't want it to move.

Use of the superglue-only method (technically known as cyanoacrylate glue or CA for short), to dop stones for faceting also has its strengths and weaknesses. It is quick, easy to use and doesn't take much glue and bonds well. On the other hand, it can be quite difficult to break that bond without potential damage to your stone.

By using a combination of wax and glue, you leverage the strengths of the two materials while minimizing the negatives. Placing a thin layer of wax between the dop and the CA will allow you to keep the stone more securely in place while faceting and more easily remove it during transfer and after completion.

In addition because this combination method of dopping uses wax, which leaves an impression, you may be able to more easily re-dop a stone that came loose or fell off. Match the stone to the impression, use a small drop of CA, press stone and dop together and allow it to set for a while. You might be lucky enough to have it line up, thus saving time and rough.

To begin, you will wish to use a dopping wax specifically designed for faceting. These faceting waxes have a higher melting temperature. Multiple brands are available, but are typically standardized by color, most usually brown or black. You may choose any brand you wish as long as it is designed specifically for the faceting medium. Also available is green wax, typically used for cabbing. Do not use cabbing wax for this application. It has too low a melting temperature and the stone may shift or break off during cutting.

Super glue, as state previously, is technically a cyanoacrylate glue (CA). Not all formulations of CA are created equal. From personal experience, always use a good quality CA for best outcomes. Read the label and make sure it is purposed for stone. CA is not waterproof, though some claim to be water resistant. Because CA has a limited shelf life once opened, store the tightly closed container in the freezer or refrigerator to help extend the life of the glue. Note, the glue *must* be returned to room temperature before use.

Initial Dopping

With few exceptions, the pavilion is cut first.

It is important to grind a flat on the stone to form a temporary table. This can be done using a 600-grit lap. If you use a 180 lap to form the flat, you will have more damage to undo later when you are cutting and polishing the actual table.

Select a flat dop of appropriate size. This should be about $\frac{3}{4}$ the size of the finished stone.

Clean the stone and dop with alcohol. You can use acetone but some believe that it leaves a thin chemical layer that may interfere with bonding. Do not touch the surfaces that have been cleaned as skin oil from your fingers can cause a weak or failed bond.

Heat the wax a bit until it is soft but not runny, scorched or burning. Heat the dop itself without touching the cleaned surfaces. Attach a glob of the faceter's dop wax to the end of the flat dop.

This next step can be done one of two ways. The first method uses a 45-degree table dop and a lap. The second method uses a transfer fixture and another flat dop. The idea is to have a thin pad of wax, about a millimeter thick, between the dop and the stone. This will allow for an easy removal of the dop later. The bond between the stone and the CA is strong. Having a bit of wax between the stone and the dop will allow you to heat the dop, melt the wax a bit, and remove the stone before the heat gets to it.

First method: Use an old 600-grit lap and a 45-degree adapter. Adjust the angle on the faceting machine to 45 degrees. Make sure the cheater is on zero. Insert the dop with the wax on its end into the adaptor and grind a flat on the wax glob. Be sure NOT to grind the wax back down to the dop. Your goal is a pad of wax about one millimeter thick. Use a lot of water while cutting the flat on the dop. It will help keep the lap from plugging up with wax. The surface left by the 600-grit lap will be just right, not too smooth or too rough, for a good bonding surface. The lap can later be cleaned with alcohol and a stiff brush.

Second method: Use a transfer fixture with one fixed end and one moveable end. Stand it up vertically with the fixed end down. Place the dop with wax on its end into the non-moveable part of the transfer fixture, wax end up. Put a smooth, flat dop that is obviously larger than the first dop into the moveable part of the transfer fixture. Lower the smooth, flat dop onto the wax glob and flatten the wax to about one millimeter thickness. The smooth, flat dop is cold and the wax should not stick to it. When you pull it back up the transfer fixture, it should leave a smooth, flat wax pad on the lower dop.

Now it is time to dop your stone. This should be done at room temperature, ideally with a humidity of 40% to 60%, which is slightly alkaline and will let the CA cure best. (Do not dop in the laundry room.) You should have already aligned the stone's flat, temporary table so that it is centered over the dop onto which you have pressed the pad of flattened wax. Place a small drop of CA onto the flat wax, press the stone's flattened table onto this and let it cure. Use a SMALL amount of CA. If the glue squeezes out beyond the wax, you have used too much. More glue does not make a better bond; it makes a bond that is too thick to cure properly.

After the CA has cured and the bond is secure, you may coat the joint with a thin varnish of fingernail polish to make it waterproof. After you are done with the dop, clean it by using acetone to dissolve both the CA and the fingernail polish.

Transferring

To transfer using wax and CA, begin by choosing a cone dop that is $\frac{3}{4}$ size of your stone and clean it well with alcohol.

Place the cleaned cone dop into the lower, fixed end of the transfer fixture and fill it with warm, soft dop wax. After cleaning the pavilion with alcohol, place that dop into the upper end of the fixture, pavilion end down. Press the pavilion into the warm, soft wax. Don't press so hard that you bottom out- you want some wax between the stone and the metal of the dop, especially at the culet. Because the stone is cold, it should not stick to the wax, but will leave an exact

impression of your pavilion in the wax.

Allow the dop and wax to cool.

Place a SMALL drop of CA on the wax, press the pavilion of your stone into the cone/wax/CA and let it cure. Coat the new joint with fingernail polish for protection against water. One author suggests several really small drops of CA instead of one small drop. He uses a sewing pin to make these really small drops.

Remove the crown dop by holding it horizontally and applying just enough heat to the metal portion of the crown dop, usually with an alcohol lamp, to soften the wax and allow the stone to come off. With practice you can use a little less heat and twist off the dop using very light pressure.

Some faceters prefer to use wax and CA when dopping to cut the pavilion and then use five-minute epoxy to dop to cut the crown. Use a good quality epoxy, such as DevCon, make sure all dops and the stone are cleaned with alcohol. Let the joint cure a sufficient amount of time and use a heat sink (wet paper towel) wrapped around the dop you do not wish to remove. See the article on dopping with epoxy for specific instructions.

After you are finished cutting your stone you can remove it from the dop by either applying a little heat to the metal portion of the dop to melt the wax enough to allow the stone to come free, or you can soak the dop and stone together overnight in a small jar of alcohol or acetone. Acetone will break the CA bond.

Dopping with Wax

By John Franke

I use dop wax almost exclusively because it is reasonably fast, efficient, and allows for adjustment when necessary. I use an alcohol lamp with 99% isopropyl alcohol. 91% and 70% are available, but use them only for cleaning stones; they do not burn hot enough for dopping.

The concept is simple: get the wax and the stone/dop hot enough for the wax to flow, and it will bond the two together. When the flow is right, it spreads out like the roots of a cedar tree (assuming the tree is the dop holding planet earth). It does not have a rounded edge like a lava flow, which is a sign that the surface below the wax is not hot enough to bond correctly.

I started out using only Raytech brown wax, but have changed my system so that now I use Diamond Dop wax (melting point 175 degrees) for the initial bond, then Raytech brown wax (melting point 145 degrees) for the transfer. This helps during the transfer because the brown wax is at the flow point 30 degrees before the initial Diamond Dop starts to melt. This reduces the chances of the stone shifting in the transfer process. I carry dopping wax in my shop, available at www.gemcutter.com.

Initial dopping

I preform a stone by hand and grind a flat face where I expect the table to be. I generally use a dop about 1/3 the diameter of the expected finished width of the stone. I heat the dop over the alcohol lamp with the flame under the last half-inch of the end of the dop to which I will bond the stone.

After a few seconds, I start touching the dop wax to the end of the dop, and when the wax melts onto the dop I know it is warm enough, so I coat the end and about 1/4 inch of the adjacent sides with dop wax. I set the dop down and use tweezers to hold the stone while I heat it over the alcohol lamp. I touch the dop wax to the stone until the wax easily melts onto the stone, and I cover the entire flat with dop wax, making sure it flows onto the entire surface.

I continue holding the stone over the flame and start reheating the end of the dop with the wax on it. When the wax appears to be flowing, I push the stone and dop together and align the stone as necessary.

Transfer

I keep a mix of 99% isopropyl alcohol on hand (in a sealed container) with just enough dop wax in it to make it an amber color. I generally dip the pavilion of the stone to be transferred into this mix to coat the stone with a very thin layer of dop wax, which makes it easier and quicker to get a good bond. It takes just a few seconds for the alcohol to evaporate.

I place the stone/dop into the transfer fixture, and then prepare a second dop for the stone to be transferred to. This means I heat it as above, and add fresh wax if necessary. I place it into the transfer fixture and continue heating the second dop until the wax is melted, keeping the flame under the last 1/2 inch of the dop, not at the very tip. Always avoid directly heating the stone to be transferred!

Gently push the second dop into contact with the stone, and continue heating the **dop** until the wax flows. While doing this, keep turning the transfer fixture so that you are spreading the heat around the circumference of the dop as evenly as possible.

When the wax flows, **immediately** remove the dop from the heat source. If the flow seems uneven, you can let the wax cool down, and then hold just the questionable area over the lamp until it flows correctly. The objective is to get a good bond without letting the stone shift, so two short heatings are better than one heating that goes too long.

Let the whole assembly cool down, and then remove the dop-stone-dop assembly from the transfer fixture. Heat the initial dop while holding the stone (if possible- that way you know if the stone is getting warm) and gently pull the dop away from the stone; when the wax melts, it will release the dop. Wrapping a wet bit of paper towel around the second dop can help keep the dop wax from getting too warm.

Variations: During the transfer, you can heat the wax on the second dop until it melts, push it onto the stone, and then immediately pull it back. This leaves an impression of the stone in the dop wax that you can put a drop of superglue into and then glue the stone into the dop wax mold. This takes longer, but has less chance of the stone shifting. Some faceters use wax on the initial dop so that they can adjust the alignment if necessary, then use superglue or epoxy for the transfer.

Note: Some types of dop wax do not have an obvious flow when they are at melting temperature. These are fine to use if the surface is hot enough to make the bond, but require that you have the experience to recognize that point. You can heat a small knife or screwdriver over the alcohol lamp and re-melt the dop wax at specific points to make sure the bond is good.

Dick Walker's current favorite dopping wax is from India and is sold by Ramrock Supplies, 42961 Green Mountain Drive, Lebanon, OR 97355. 541-451-3649.

Dopping Stones 4mm and Smaller Using Instant Glue ***By Joe Apodaca***

Take special precautions when cutting a small stone. Since there is not much holding area on a small stone, it is best to use a light, delicate touch. Begin with a 600 grit lap, nothing coarser. Run your machine slower than you would when cutting a larger stone to lessen heat buildup. Small stones cut and polish very quickly.

I use Loctite 409 Superbonder Industrial Grade Gel #40904, 3-gram tube. The only place I have found this is R.S. Hughes Co in Portland. 503-289-6715. <http://www.rshughes.com/>. I have great luck using this industrial glue, but other instant glues may also work.

Many forms of CA (super glue) have entered the marketplace. Some are purposed for uses we don't want, like surgery. Read the label or buy a brand that another faceter recommends.

Initial Dopping

1. Prepare three dops. Dops A and B are flat and Dop C is a concave (cone) dop. Use dops of appropriate size for the finished stone. Clean with denatured alcohol or 99% Isopropyl alcohol to remove all traces of oil and dirt. Dop A can be a "target dop."
2. Place Dop A into your transfer fixture, standing the fixture up with the dop at the lower end. Put a small ball of modeling clay onto Dop A. Place Dop B into the upper end of the transfer fixture without touching the cleaned end of the dop.
3. Using a 600-grit lap, grind a flat spot on your rough stone, forming a temporary table and a place to dop.
4. Clean stone with alcohol as in step 1, removing all traces of dirt and oil.
5. Place your stone on the modeling clay on Dop A with the ground flat side up.
6. Slide Dop B down onto the stone, making sure the flat end of the dop meets flush and centered with the ground flat of the rough. When stone and dop are matched, back the dop away from the stone.
7. Using "instant glue", place a drop of glue on the ground area of the stone.
8. Push Dop B down onto the stone firmly and count to 15. The stone will be well cemented to Dop B, but I like to let it cure for an hour before starting to facet.

Transfer

1. After cutting the pavilion, clean the surface of the stone with alcohol and place Dop B into the transfer jig, at the lower end.
2. Clean Dop C, the cone dop, with alcohol and place it in the upper part of the transfer jig. Carefully slide Dop C down onto the stone's pavilion to make sure the stone fits well into the concave top of Dop C. Raise Dop C back away from the stone.
3. Place a drop of instant glue onto the end of the pavilion.
4. Slide Dop C down onto the stone, pressing firmly for 15 seconds to set the glue.
5. Now you remove Dop B from the stone. Wrap Dop C and the pavilion of the stone with a wet paper towel. Hold Dop C in your fingers, touching the pavilion so you know you aren't heating it too much.
6. Using an alcohol lamp (or small torch) slowly heat Dop B, keeping your heat source at least half an inch away from the stone. The heat will slowly travel up the metal dop until the glue melts and Dop B falls off. Be patient and do not force the dop off, as this may cause misalignment of the stone. This glue weakens at about 150F.

7. If you can, wait an hour before cutting the crown.
8. To remove Dop C, heat dop slowly, at least a half-inch away from the stone, until the heat travels up the dop enough to melt the glue. You can remove the stone with your fingers.

Dopping with Epoxy Paste

By Steve Richards

Most of the time that I have faceted I have used an epoxy paste to dop. I use the Do-it Best brand # 387061. Here in Portland, I order it through WC Winks Hardware but it can undoubtedly be ordered from any dealer that carries that brand. Check the website www.doitbest.com to find a dealer near you. There are several reasons why I like this compound.

This thick paste epoxy does not run like most epoxies. It stays where you put it. The two parts are quite thick and get a bit softer as they are mixed. One is tan and one is white, so it is easy to see and feel when a good 50-50 mix is achieved. Use a transfer fixture to hold the dop and stone, just as described in the dopping with epoxy method. I then just scoop a glob onto the end of a dop and press it onto the stone. The working time is about 20 minutes, from starting to mix until it has set too far to use. Several stones can be dopped in this time. After about 45 minutes, it has set to the point that it is no longer sticky and can be finger-molded around the dop to produce a smooth surface without sharp points sticking out. This step is cosmetic and not necessary, but it does keep me from poking my fingers on epoxy points. The instructions say that it reaches a complete cure in 12 hours at room temperature, but I usually let it cure overnight.

Because the design of this epoxy is intended for both filler and adhesive, I do not need a close match between the dop and the stone. This means that I do not have to grind a flat temporary table before dopping. Even so, I have only had a couple of small stones come off the dop. (I have yet to find a reliable way to dop a 2 or 3mm stone.)

The paste epoxy can also be used to transfer to cut the crown. Use the method described in the article on epoxy dopping to set up the stone and new dop. After the epoxy holding the second dop has cured, use an alcohol lamp or a small butane torch to heat the first dop until the bond loosens and the dop can be removed. This always results in the dop coming free and leaving the epoxy on the stone. If it is warm, the epoxy will then peel right off. If not, it is hard enough that I simply grind it away while faceting.

When the stone is complete, I then heat the dop until I can pull the stone off and peel the epoxy off the stone. Any epoxy left on the stone can be chipped away with a thumbnail. I have yet to scratch a stone. I prefer not to use the chemical *Attack*, but it should work if you need to use it. There are some new paint removers for epoxy paint, such as the JASCO product sold at Home Depot.

To speed up the curing process, put the newly dopped stone under an incandescent lamp and heat it for a couple of hours. Allow it to cool before faceting. However, be aware that this really makes the epoxy hard and creates an extremely strong bond. I once pulled a piece out of a quartz stone doing that.