



PHOTOGRAPHS TAKEN BY KURT HERTZOG

What you need to know about adhesives

Kurt Hertzog explores the subject of adhesives

The topic of adhesives can have differing importance to a woodturner depending on their types of turnings and whether woodturning is an avocation or occupation. Many woodturners will only use adhesives to perform repairs. Others will use adhesives as a major component in the creation of their turning blanks. Some know adhesives more as a finishing agent than a bonding agent. Regardless of your particular position in the continuum of woodturning, knowing what adhesives you have at your disposal will be an asset to you either now or in the future.

As we explore the different families of adhesives in this article, we'll concentrate on the types that are readily available to the

common woodturner. There are speciality types of adhesives available for the niche markets, high demand applications and only to the professional in larger industrial size quantities, but I haven't included those in this article for reasons of space and limited interest. The uses of adhesives can be parcelled into a few different use categories. These are finishes, temporary in-process bonding, permanent bonding, repairs and cosmetics. As we explore the subject of adhesives further, we'll speak of generic families, avoiding specific brands. The use, storage, tips and tricks of use and understanding of the specifications will let you select and use the proper adhesive wisely and safely.

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SAFETY

Regardless of your brand, type and source, each package of adhesive will have instructions on safe use, storage, handling and any special precautions you are required to take. For the most part, the adhesives we use are very safe yet common sense needs to prevail. Safety glasses should always be in place when working in the shop whether turning, working with chemicals or

any time there is any possibility of eye injury. The same goes for adhesives and any other chemical handling. Food service or the more chemically protective nitrile gloves should be used when handling chemicals. Adhesives are just as troublesome when you get your fingers stuck together or you become fastened to your 400kg lathe as they are when you come in contact with any chemicals that aren't

particularly health friendly. Glasses and gloves are highly recommended in addition to any ventilation recommendations or other special precautions the manufacturer might advise. As always, the use of the tailcentre helps provide additional security when turning and should be used whenever possible. It is advisable to keep it in play until you are forced to remove it for access.

ADHESIVE TAPES

There are a host of adhesive tapes available to the woodturner with the reinforced and double-sided adhesive versions being the most helpful. Of course, single-sided tapes can find use in the lower strength applications ranging from padding to low demand fastening. When mounting work, glass-reinforced tape can help secure work being mounted so it can be turned more safely. Because the tape requires a sharp cutter to release it, it adds that extra measure of security to your work holding. There are also double-

sided adhesive tapes in the marketplace appropriate for woodturners. They can be thin or more padded depending on your end use. These tapes can position and secure patterns, fasten stock for processing or aid in some other method of holding. The grip provided is very helpful for drive provided you use the tailcentre for security. Very light-duty applications for detail pieces can use tape alone for sanding or very light-duty cutting, particularly if the detail piece is supported on a form fitting mandrel.

KEY POINTS OF ADHESIVE TAPES

1. Surface texture and cleanliness will greatly impact holding strength
2. Cross sectional area of attachment is directly proportional to grip provided
3. Removal after use may cause surface damage
4. Use of tailcentre for safety is highly advised
5. Usually best for light duty and/or temporary in-process fastening
6. High strength fiberglass reinforced tapes are available



There are a host of single- and double-sided adhesive tapes available. Some reinforced versions are incredibly strong. Be certain to err on the safe side



Lightly padded with low-tack painter's tape in the jaws, this turning is secured in the chuck with fibreglass-reinforced tape for the light work done on the foot



Low-tack painter's tape has a variety of applications from masking off areas for protection to padding to low strength holding needs

HIDE GLUES

Hide glues have been used for centuries for two main reasons. First, they were the only adhesives available in the very early days. The reason they continue to find favour with the advent of other adhesives is their reversibility. The furniture maker will often select hide glue for the sake of tradition and the ability for the bonding to be disassembled and repaired years down the road. Those who wax nostalgic about the hide glue pot in the corner of the shop aren't those who will use the modern hide glue available in the squeeze bottle. I include the hide glue because it can be readily used in the original or more modern factory prepared version for

assembly of furniture and turnings. The ease of reversibility and historic authenticity make it still a viable adhesive though not as widely used among the general turning population other than furniture makers.

KEY POINTS OF HIDE GLUES

1. Keep glue pellets dry and stored at cool temperatures
2. Be aware of shelf life of traditional hide glue
3. Surface preparation is sanded to 180 and cleaned of sanding debris
4. Used for assembly or veneering adhesive
5. Will shrink as it dries



The traditional hide glue is available from a variety of sources and there is the more modern liquid hide glue available as well

◀ CRAFT ADHESIVES

There are special adhesives that are formulated to bond dissimilar materials together. These adhesives are more flexible than most, allowing for the fastening to endure materials with different coefficients

of expansion. One of the craft adhesives that can be used to bond woods, glass, metals, ceramics and other materials is E6000, which is a high strength craft glue that provides excellent adhesion. There may be

other brands available in your area. Perform a test application prior to committing to this adhesive for anything critical. Be especially vigilant if using the adhesive in an application requiring strength.

CYANOACRYLATE ADHESIVES

Cyanoacrylate adhesives, or CA glues, are manufactured around the world by a number of companies. While each manufacturer will tout why their brand is the best, there are enough similarities that we can treat them generically for our needs. Most manufacturers offer a range of thin, medium and thick glues, though they may have different monikers for their brand viscosities. Some makers also offer super thin and special 'finishing' CA types. CA adhesive is most famous for the speed at which it can be dispensed, cured and then used. Often used as a finish, especially for smaller turnings, it is exceptionally tough. Once cured or cross-linked, it is a plastic with the protection that a plastic coating can offer. Another common application for CA is to fill gaps or cracks. The ability to wick into cracks and crevices makes it ideal to use with a filler. The filler is packed into the opening whether a repair or an artistic expression followed by wicking in of adhesive. Cyanoacrylate adhesive cures with the water vapour in the air but can be accelerated with special chemicals, aerosol or liquid, offered by the manufacturers. Fixing of glue blocks can be done if used with care. Because it is nearly 100% active ingredients, there is minimal shrinkage with gap-filling capabilities in the higher viscosities.

- KEY POINTS OF CYANOACRYLATE ADHESIVES**
1. Low odour versions are available for those sensitive to CA adhesives
 2. Keep debonder readily available to free yourself from accidental gluing
 3. Use caution when opening initially and thereafter
 4. Gloves are recommended for protection from chemicals and accidental gluing
 5. If accidentally glued, go slowly and work with debonder to free yourself
 6. Proper viscosity will fill modest gaps
 7. Be cautious of heat generation on curing or on paper towels used with CA
 8. Can be somewhat brittle compared with other adhesives
 9. Accelerator use can cause visual frosting of adhesive
 10. No real open time issues



CA adhesive works nicely to bond woods and plastics together. Proper cleanliness and clamping can create a virtually invisible bond line



My 'go to' collection of adhesive types covers most of my needs. The CA adhesives in the back are of varying viscosities, accelerator and special finish blend



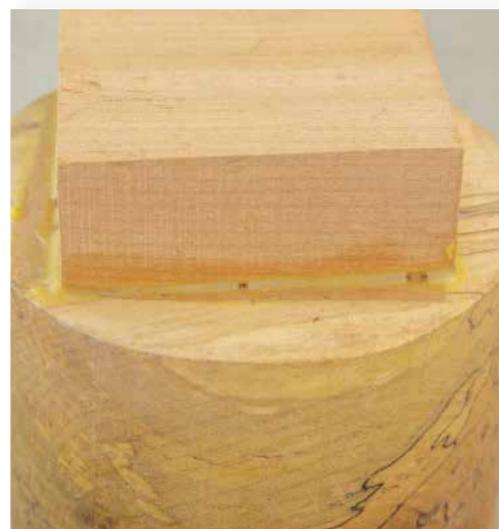
I use a CA finish on my turned pens almost exclusively. It is simply wiped on in very thin coats and repeated until the build thickness desired is achieved

PVA ADHESIVES

PVA - polyvinyl acetate - adhesives are commonly known as wood glues with some being a white glue. Whether white, tan, brown or other colour, this common wood glue accounts for the bulk of the woodworking adhesives used. There are a few commonly recognised names in the industry though most brands function very similarly. It is a polymer that is suspended in water. When the water leaves, the polymer chains bond everything together. Colourants can be added to the adhesive provided it can be dispersed in water. Dyes should be added as a liquid and mixed into adhesive. Food colouring will work quite nicely. In order to maintain the best finishing capability, excess adhesive should be removed promptly via mechanical means. A damp cloth can also aid in removing excess adhesive

while soft. A quick test of the functionality of adhesive in question can be determined by rubbing between your fingertips. If it feels gritty, it probably should be discarded and exchanged for new. If it dispenses as a liquid from the container and the rub test doesn't feel gritty, it will likely function properly. There are two key points of advice: don't forget to mix it well before use and get a stick and put it right into the storage bottle and mix thoroughly. The heavier constituents will settle with time. Stir, don't shake. The temperature on the label is no joke. Below that temperature, the glue does not cure.

A common use for wood glue in turning is to add a high-strength glue block to fasten a faceplate. Grocery bag paper is added to the joint to allow for cleaving



PVA ADHESIVES

KEY POINTS OF PVA ADHESIVES

1. Work above the minimum recommended temperature
2. Surface preparation is sanded to 180 and cleaned of sanding debris
3. No excessive gaps between materials
4. Avoid multiple storage freezing cycles if possible
5. Stir glue in storage container with a stick to mix the heavy and light elements
6. Shaking will NOT MIX the settling of elements in the adhesive
7. Clamping necessary before open time limit for strongest bond
8. Open time can vary widely based on temperature, humidity and wood moisture
9. Strength progresses over time to maximum at 16 to 24 hours
10. Room temperature bond strength far exceeds elevated temperature strength
11. Excessive heat generated by sanding can degrade bond
12. Typical applications are turning blank assembly or mounting block fastening



A bowl turned from glued-up flat stock fastened together with wood glue. The glue bond strength even with this very thin wall is exceptional

Wood glue is the adhesive of choice for the segmenter. The segmented blank is usually created using a 'rub joint' methodology providing strength and minimal witness line

HOT MELT ADHESIVE

Hot melt adhesive is a thermoplastic. Add sufficient heat and it melts. When it cools enough, it becomes solid again. It will repeat this over and over so the removal method can be heat or mechanical. Hot melt adhesives usually find application in the process arena in the woodturning shop. Quick and low-stress mountings are possible with an art level heat gun. There are industrial versions of high temperature and high strength hot melts but they are not common among woodturners. Another application is support struts. If you have a turning component that will flex or vibrate on rotation, a temporary set of supports can be tacked in place using hot melt glue to allow for turning without vibration. At completion, the supports can be removed.

KEY POINTS OF HOT MELT ADHESIVES

1. Various strengths are available ranging from craft to higher strength industrial
2. Heat to apply, cool to use, reheat to remove or mechanically remove
3. Damage to substrate likely with mechanical removal
4. Damage to substrate possible due to temperature needed to achieve melt and remelt
5. Typical use is low-stress quick mounting or support struts for in-process holding
6. Intimate contact best for strength with hot melt bridging materials
7. Use caution with hot melts. Melted adhesive can burn you and will continue to burn because of the plastic heat transfer



A platter needing some light sanding is fastened to a faceplate platen with hot melt glue. The painter's tape provides an easy removal without tearing out grain

POLYURETHANE ADHESIVES

The most widely recognised polyurethane adhesive among woodturners and woodworkers is probably Gorilla brand. There are other manufacturers in the marketplace but Gorilla has marketed their way into wide recognition. Polyurethane adhesives cure with the water. It is a strong and permanent bond although surface wetting can create bubbles. The preparation for the adhesive bond favours a surface that is not too smooth. Sanding to 180

or so and thorough cleaning will allow for a strong bond. The problem with polyurethane adhesives is the curing in the container. Once opened, they seem to begin to harden almost immediately and rarely get used entirely before the container contents set up.

Because the wood will forever move with moisture change and the brass tube is rigid, I find the amount of compliance in the adhesive minimises cracking over time

KEY POINTS OF POLYURETHANE ADHESIVES

1. Surface preparation is sanded to 180 grit and cleaned of sanding debris for tooth
2. Water content needed to effect adhesive curing
3. Foaming of adhesive likely but easily removed
4. Maintains a bit of compliance
5. Common use is for tube fastening in pen blanks
6. Very difficult to remove from skin. Wear nuisance type gloves





Two-part epoxies lend themselves well to colouring. Most will easily accept artist colours, pigments, wood dust or other fillers willingly with minimal property loss



Epoxy by its nature is a great gap filler. It will impregnate end grain, provide a smooth surface coat and can even be used as a durable finish



Because of its viscosity, it makes a great assembly adhesive staying where it is put until cured. It is a high strength permanent bond that is difficult to reverse

EPOXY ADHESIVES

Nearly everyone has used epoxy adhesives at one time or another. The commonly found two-part epoxy is available at every hardware store and often the pharmacy as well. The properties of the various manufacturers' versions of epoxy range widely, as do the prices. The commonality is usually the mixing ratio of 1 part resin to 1 part hardener but some specialty brands have different ratios. Of all of the adhesives, epoxy is probably the most versatile. It can be used to fasten wood to wood as well as wood to dissimilar materials together in a permanent bond. It is

impervious to nearly all of the chemicals it is likely to encounter. Refrigeration or freezing can extend the shelf life tremendously. The cost can be very modest and up. While not UV resistant or meant for outdoor use, it can easily be overcoated with materials that provide UV and moisture protection. Epoxy makes a superb dense and stable undercoat for additional surface treatments. Most of the early painted turnings had an epoxy undercoating upon which the exotic painting process was created. After nearly 40 years, most of these works remain intact with minimal ageing or damage.

KEY POINTS OF EPOXY ADHESIVES

1. Good storage characteristics as two-part
2. Easily coloured with a wide variety of colouring agents
3. Permanent and durable upon curing
4. Can be used as a finish
5. Minor clarity change on curing
6. Easily metred, mixed and applied
7. Has gap-filling capabilities
8. Doesn't get brittle with age
9. High strength and durable

COMMON PROBLEMS WITH ALL ADHESIVES

There are some problems that are common to nearly all adhesives. When there is a failure, one or more of these is often overlooked as the root cause. Adhesive bonds will always be difficult on oily woods. If you are trying to create a bond to or between two oily wood surfaces, you need to prep the wood carefully. One method that will usually work is to remove the surface oil by wiping it with acetone in a cloth. Continue to clean the surface until the cloth shows clean. At that point, when the acetone has flashed off, put the adhesive on the surface as appropriate and clamp as needed. With a clean surface, the bond will usually take place and the clamps can be removed once the usual clamp time has passed. Another common problem that is often attributed to adhesive failure is high moisture content. Depending on the moisture present in the wood to be bonded, the adhesive may or may not cure properly. Even if it does cure properly, the surface will continue to move as the moisture leaves the wood. This wood movement will stress the glue joint

beyond the elasticity limit, creating failure. This failure is attributed to the adhesive rather than excessive wood movement. If the wood needs to be adhesively bonded, it is important that the base materials be at a moisture content where the movement is within the acceptable limits. If not, the materials should be dried to the proper values.

KEY POINTS FOR ALL ADHESIVES

1. Cleanliness is absolutely key to any good adhesive joint
2. A burnished or too smooth surface finish is not conducive to a good bond
3. Prepare to the appropriate surface finish, then clean prior to adhesive application
4. Pay attention to the working temperature window for proper curing
5. Clamp as recommended for the specified time at the temperature being used
6. Pay attention to proper storage conditions and shelf life for best results



Just a few of the adhesives available to the woodturner. Each one has both positives and negatives to their selection. Make your selection based on the needs of the application

CONCLUSIONS

Adhesives is a broad and far ranging topic but hopefully this article has given you good guidelines and the selection

criteria to be successful. Look for additional information but be cautious when using advice from an internet forum where everyone is an

'expert'. Contact the manufacturer directly. They are easily found on the product label or a simple internet search of the company. ●