Rodmakers Planing Bench Notes

ADHESIVES UPDATE-2

By John Zimny

It's good that varnishes and adhesives are being discussed in the same seminar, because, they enjoy almost all the same characteristics. Both are resin systems that dry or polymerize and adhere to a surface. For all intents, they exist on the same continuum. The real difference between the two is the use to which each is put.

If you have had an opportunity to read "Adhesive Update-1", you will have explored most of the different classes of adhesives available to the contemporary rod maker. However, in the several years between that work and today, I have found new information and new methods that will be useful to all rod makers, both novice and experienced. I will explore each class of adhesives in turn; and, hopefully, add some new techniques to our presently accepted practice.

UREA FORMALDEHYDES

UF's have demonstrated continued usefulness to the rod maker. Two companies in the US are currently producing a variety of UF formulations- Borden's and American Cyanamid. Borden's "Perkins L-100" and American Cyanamid's "URAC" are the two resins most often used by those makers using UF's. Both resins "kick" or catalyze by the introduction of an acid salt, such as ammonium chloride to the resin mixture. All of the companies supplying these resins currently supply a powdered catalyst that is largely (99%) walnut flour. The purpose of the walnut flour is to fill gaps. In my own rod making, I simply dispense with the walnut flour, and "kick" the resin with straight ammonium chloride. The mixture is thinner and the glue lines virtually disappear. One should determine if the particular resin being used contains a wetting solution. This is usually, but not always, furfural alcohol. If it does not contain a wetting solution, get some GS-10 from Custom-Pak. The optimal percentage of this in the mixture is 71/2% by weight. (URAC does contain furfural alcohol) Below, is the mix that I use in gluing many of my own rods.

L-100 Resin
10% Water
7.5% GS - 10
9% Ammonium Chloride

Note:

- all percents are by weight
- Ammonium chloride is best dissolved in water and then added to the mix. This gets quick and even dispersal of the catalyst.

The whole class of UF's can benefit from a post cure in your tempering oven. I heat mine to 65C, add cane, and turn the power off. About two hours later I return and remove the rod sections. I begin working on the sections the next day.

MELAMINE RESIN MIXTURES

The addition of a proportion of melamine resins to a UF mixture can increase the "grab" and water resistance of a UF formulation considerably. Melamine resins bond well with slippery surfaces and offer impressive heat resistance as well. American Cyanamid's expert on these mixtures recommends a 2 hour post cure at about 97C.

There are two products on the market that are currently available to rod makers. The first, a proprietary mixture made by American Cyanamid, is called MELURAC. This is available in powdered form with a catalyst already in the mixture - the user adds water to activate the polymerization process. The other product is a liquid Melamine resin by Bordens available from Custom-pak. One merely adds the wanted proportion of resin to the UF mixture. American Cyanamid will also sell powered melamine resin for addition to URAC. An addition of 5 to 10% melamine to a UF mixture will increase the cured glue to a type I water resistance, increase its heat resistance and increase the "grab" of the uncured resin.

EPOXY RESINS

The best epoxy formulation available for rodmakers is Shell Epon 828 resin and 3140 curing agent. I say this because the non-post cured resin reaches thermal plasticity at 186F but does not fail until reaching temperatures of 385F. This means that you can heat your rod sections, straighten them, and have enough margin for error in the application of heat, that you won't have to worry about catastrophic failure of the cured resin. Many epoxies don't soften until much higher temperatures are reached. In many cases, the failure temperature and the "glass transition temperature" are only 15F apart. This means that there is little margin for error in the application of heat for straightening, in these particular formulations. The downside to the EPON formulation is that a rod glued with it probably won't survive a few hours in a car window. But then, neither will the varnish.

One last aside regarding epoxies. I have found no "hardware store" epoxy formulation that is suitable for gluing rods. You'll have to go to industrial formulations if you want the "good stuff".

I want to thank Bill Fink, a most talented rod maker, for letting me in on his Shell Epon epoxies. He came across them some years ago at his work and has been happily sharing his find ever since then.

CROSS LINKING PVA'S

I have in my possession a sample, from Custom-Pak, of a catalyzed polyvinylacetate with included phenolic resins. This glue is as strong as epoxy, has high resistance and type I water resistance. All this and light color. I'll let you know how all this turns out when I try it in the fall.

TINTING YOUR GLUE

Yes, you can use pigment in your glue mix. Indeed, I know of no resin system that will not tolerate every pigment known to man. One can tint UF's with titanium dioxide so that the glue blends perfectly with a blonde rod. And yes, you can lighten resorcinol considerably. But alas, the effect is not permanent. The phenolic compounds gradually oxidize into the characteristic dark, reddish brown after about six months.

EPOXY FERRULE GLUE

Many epoxy formulations do not maintain good shear strength in temperatures below freezing. As the temperature goes down they get increasingly brittle until they break away from the side of the ferrule upon flexing. Most formulations maintain good strength until flexed. But when that happens they part due to shear forces. A few makers have been aware of this and have been using rubber cement to avoid the problem. It works. But, rubber cement isn't very strong.

However, a quick phone call to the experts at Shell revealed that there is an Epoxy formulation that has all the properties for good ferrule connections and works in the cold too. Indeed, at normal temperature, 25C, this formulation has an elongation factor of 400%. Its psi strength and bonding ability are impressive. It even bonds oily steel. The resin is Shell Epon 8132 and the curing agent is number 3164. There are other Shell resin systems almost as good; so, you can look at the specs and choose whatever system you think is best.

POLYURETHANES

There are polyurethanes out there that are suitable for the rod maker. Most are European in origin. They are a mess to work with because of the nature of the operations that we perform on our materials. Polyurethanes cure from the ambient moisture in the air. As one handles the glued rod sections things get increasingly sticky. Water will wash off the uncured resins. Boat builders tests indicate that the cured resin is not stable when immersed in water. The bond strength after immersion is in question too. But, in their favor these shortcomings should not deter the rod maker from giving PU's a try.

HOT MELTS

For those makers who are willing to make some changes in their usual construction order, there are industrial grade hot melt glues that might be suitable for rod making. One that I have found is Asmit 226 resin. It melts at 146C and gives bond strength and water resistance similar to Polyurethanes. Asmit is not currently in Canada.

SUMMARY

Because adhesives are needed by industrial producers of various products, we are assured of a continuing supply of good, useful adhesive formulations for the rod maker. Much of the best ones available are not sold on the shelves of consumer oriented hardware stores and auto shops.

Suppliers:

Custom-Pak Adhesives Inc
11047 Lambs Lane
Newark OH 43055 All sorts of adhesives, mostly Borden proprietaries.

Nelson Paint Co.
PO Box 2040
Iron Mountain MI 49802 URAC

Miller-Stephenson Chemical Co.
George Washington Highway
Danbury CT 06810
203.791.8702 Shell Epoxies

Miller- Stephenson Chemical Co.
514 Carlingview Drive
Rexdale Ontario M9W 5R3