

Premature Epoxy Stiffening Tests and Solutions

Regarding the problem of Bicon-600 optical epoxy reacting with little warning, violently hardening and turning a translucent yellow color while producing enough heat to melt the cup it is in, we believe to have found an effective solution.

For the previous prototype modules, identical products have been used: epoxy resin and hardener mixed in a 100:28 mass ratio, clear plastic Dixie cups, white plastic disposable spoons and generic 2 inch disposable paintbrushes. As this sudden hardening of the epoxy had not been observed in previous years, it was deduced that it must either be a factor of the longer times we are using for each gluing session, or the larger amounts of epoxy being mixed per batch. A simple test to confirm this was performed.

July 12, 2004 4:30 pm start

Test	5:00 pm	5:20 pm	5:30 pm	5:35 pm	5:45 pm	5:55 pm
1. 2 cm full; undisturbed	warm	hot	hardened	--	--	--
2. 1 cm full; with brush	unchanged	unchanged	unchanged	unchanged	warm	hardened
3. 1 cm full; 20 degree water bath	unchanged	unchanged	unchanged	unchanged	unchanged	unchanged
4. 1 cm full; under incand. light	unchanged	unchanged	unchanged	warm	hardened	--
5. 1 cm full; held in hand; stirred	warm	warm	warm	hardened	--	--
6. 1 cm full; in glass jar	unchanged	unchanged	unchanged	unchanged	unchanged	unchanged

Notes: Numbers 3 and 6 appeared to harden slowly as expected, all tests in plastic Dixie cups except number 6.

Conclusions: Surface area to volume ratio appears to be the most crucial element to maximize in order to allow heat from the natural curing to dissipate, hence allowing the epoxy to cure slowly. Second critical factor appears to be heat. The glass held in hand for the duration of the test was considerably warmer from the onset, but the occasional stirring of the solution (to simulate the agitation from the paintbrushes during a gluing session) seems to have kept the violent hardening process in check. The brush in the solution seems to have had little effect, confirming that a chemical coating on the bristles was not to blame. The mixture that was placed under the incandescent lamp (with UV filter) did not feel to be in a much different environment than a mixture simply sitting on the side bench; the orientation of the lamp did not seem to be able to throw a lot of heat directly on the epoxy.

Suggestions: Since the mixtures in the glass jar and in the water bath both seem to be least prone to violent hardening, the decision was made to use small amounts per glass (evenly divide a 200:56 resin to hardener mix into four cups) and leave them in a room temperature water bath during a gluing session. The glass jars would presumably have worked just as well, but we either would have had to dispose of a ridiculous number of small glass jars (approximately six to eight per two hour gluing session) or clean them—which aside from the inconvenience would have questionable effectiveness. Since these practices have been implemented, we have not had a single cup of epoxy wasted.