

Conservation Notes

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CERAMICS



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USING ACRYLOID B-72 FOR THE REPAIR OF ARCHAEOLOGICAL CERAMICS

by Stephen Koob*

Introduction

The conservation and restoration of pottery can no longer be dismissed as a task for "pot menders." The skill and expertise of a pottery restorer should be both respected and admired, as should the background and knowledge of materials science that goes with it. Improper adhesives and haphazard reconstruction techniques have already irreparably damaged many fine ceramics and should be replaced with predictable, stable, and safe materials. Whether the pottery is slated for archaeological study or museum display, simple methods and materials can be used which will ensure a structurally sound and stable reconstruction.

Cleaning and preparation

In order for fragments to be properly assembled, it is first necessary that all the broken edges be clean of dirt, grime, and interfering deposits. The exterior and interior surfaces are also generally cleaned for cosmetic reasons, or to reveal decoration or information. In many cases it is not necessary to entirely strip off these burial (or use) deposits, since they will not interfere with the actual reconstruction, and may be of significance in archaeological study/research. Water washing is generally safe for well-fired pottery, but may not be safe for very poorly fired earthenwares, terracottas or pottery with post-firing applied slips and pigments. Chemical cleaning for the removal of disfiguring accretions or staining should only be done by trained and experienced personnel. When in doubt, consult with a conservator and archaeologist (or curator). Extremely weak and friable pottery may require consolidation (see below).

Equally important is the assessment of the pottery itself, as to its dry strength (if originally found wet), and to the question of soluble salt contamination. This contamination is too long a subject to be dealt with here, but should be addressed as part of the cleaning and stabilization of pottery. Soluble salts can be introduced into pottery from burial, improper chemical cleaning, or manufacture with salty clay (e.g., many pre-Columbian ceramics). If a salt problem is evident, the salts should be removed by soaking in distilled or deionized water and proper monitoring done to determine at what point the pottery is free of contamination. (See Paterakis 1987 and Sease 1994 for further discussion of soluble salts and their treatment.)

Choosing an adhesive

The selection of an adhesive should be based not only on its ease of application, but also on its stability and reversibility. For these reasons epoxy, "super glue," and most proprietary (hardware store) adhesives should be avoided. Instead, this paper suggests the use of *Acryloid B-72* (known as "Paraloid" B-72 in Europe), an acrylic adhesive which can be made up "to order" and is not only easy to work with, but easy to correct mistakes with and to clean up afterwards. Even so, it should be cautioned that all adhesives require a certain amount of experience and skill, and one simply becomes better pot by pot.

Making up your own Acryloid B-72 adhesive

B-72 is available as a commercial adhesive, but only one company makes this formulation,¹ and the "mix" seems much too thick and stringy for many uses. Therefore, the following directions are offered "to make your own".

Start with a clean, wide-mouthed glass jar (such as those used for mayonnaise), and weigh it (without the lid). Pour in 100 grams of acetone² and add one rounded teaspoon of fumed silica.³ Suspend 50 grams of Acryloid B-72⁴ resin beads in a cheesecloth or gauze "bag" so that the bottom of the bag is just touching the solvent (see Figure 1). Use white cotton sewing thread to suspend the bag, taping the ends to the outside of the jar; be sure that the bag with resin does not touch the sides or bottom. Place a small piece of plastic (cut off a polyethylene bag) over the jar and screw the top back on. Set the jar aside.

The B-72 will start to dissolve immediately, as can be seen by fine strands of resin drifting down into the acetone. Do not agitate, and leave the jar closed overnight. By morning, all the beads will have dissolved, and the jar can be opened and the gauze bag removed. The total weight of the mixture at this point should be 150 grams plus the weight of the jar. Note the total weight and leave the jar open in a fume hood or, if necessary, in a well-ventilated area to allow some of the solvent to evaporate. Check the weight every few hours and close the jar when 45 g of acetone have evaporated.^{**} Swirl the mixture and leave it for about 10 minutes. It is now ready for use.



Figure 1: Acryloid B-72 suspended in a gauze bag to dissolve.

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**It is very difficult to dissolve such a high concentration of resin into so little solvent, which is why more than twice as much acetone is used to start with.

Centasid - keeps adhesion quality better

Suspend bag seal top w/ tape

cotton poultices or "snakes" along the join and soaking the cotton with acetone. Sometimes it is necessary to poultice both sides of the joins and then wrap the fragments with a plastic sheet. Once the fragments are apart, the remaining adhesive should be brushed off using fresh acetone. Care must be taken to remove all the cotton and cotton fibers before beginning reassembly.

An easier method to take apart fragments assembled with B-72 is to soak them in a closed container with acetone. The container can be a polyethylene bag closed with a wire tie, or a lidded polyethylene or polypropylene container (such as those used for food storage). A clear polyethylene bag allows one to monitor the disassembly. The bag or vessel should be cushioned to prevent additional damage in the event of rapid collapse. Approximately one inch of acetone in the bottom of the container is sufficient. If a lidded container is used, a corner of the lid should be lifted every few minutes to vent the vapor pressure build-up. This only needs to be done 2 or 3 times. The fragments should come apart without any pressure or pulling in less than 20 minutes (longer for very thick joins).

Once the fragments are apart, they are rinsed in fresh acetone (2-3 minutes soak in a clean container) and set aside to dry. The acetone from this second rinse can be saved for the next time other fragments need to be taken apart. Cleaning edges with cotton swabs is not recommended since wisps of cotton are left behind and caught up in any adhesive residue. Assembly procedures are started again once the fragments are dry of acetone.

Unusual Conditions

Difficulties may be encountered in restoring pottery on site when conditions are extremely hot or cold and damp. In cold and damp conditions the adhesive will set very slowly and it is recommended that work be moved indoors where a table lamp or small heater will create a better working environment.

It is possible to work outdoors in hot conditions if some additional precautions are taken. Create a shady area to work, either next to a building or under some type of cover. When preparing the adhesive, evaporate off exactly 50 g of acetone and then add 5 g of ethyl alcohol, close the lid, swirl around and pour into tubes. The adhesive will set more slowly and will bubble less on application. Always have a small beaker with acetone and a brush handy. If the adhesive starts to dry prematurely it can be *lightly* wetted with acetone, as suggested (above) for setting down small chips.

B-72 is not recommended for use outdoors when the temperature exceeds 105°F. This kind of environment is not conducive to accurate pottery restoration, and solvent adhesives do not work well under such harsh conditions. If possible, move indoors or into the shade, or carry out adhesive work in the early morning or evening. As mentioned above, B-72 will

soften above 104, so that a join will not hold. Because of this heat sensitivity, do not leave restored vessels out in the direct sun, or on top of radiators.

Storage and Handling

It should be kept in mind that reconstructed pottery vessels (or even sections of vessels) take up considerably more space than non-assembled fragments. Proper space and shelving should be allocated for storage; cabinets with doors are useful to keep dust off. Use clean hands to handle pottery, without gloves. Gloves can catch on soft or flaking surfaces. Do not lift vessels from handles or rims. Lift from underneath using both hands. Pottery vessels should not be stacked on top of one another. Keep restored vessels away from extreme heat.

Notes on Materials and Suppliers

¹HMG Adhesive, the "B-72" is now marketed in a purple tube, not to be confused with the "original HMG adhesive" in a blue tube. Manufactured by H. Marcel Guest, Ltd., Collyhurst, Manchester, England. Available through Conservation Materials Ltd, 1275 Kleppe Lane, #10, Sparks, NV 89431 Tel. 702-331-0582 or 1-800-733-5283, FAX 702-331-0588 and other conservation suppliers.

²Acetone, should be clean and clear. Hardware store quality or standard chemical grade. Do not use "paint stripper" or other mixtures "containing" acetone. Wear gloves when handling large quantities, as it can quickly dry out the skin and may cause dermatitis. It should be used in a well-ventilated area as inhalation of large amounts of the vapor may cause dizziness or headaches. It evaporates very quickly and when not in use should be kept covered and away from heat (or sun).

³Cab-o-sil (hydrophobic fumed silica): Conservation Materials Ltd, address and phone above. Aerosil R 202 (hydrophobic fumed silica): Degussa Corporation, 65 Challenger Road, Ridgefield Park, NJ, 07660 Tel. 1-800-237-6745.

⁴Acryloid B-72 (acrylic copolymer, supplied as 100% resin beads which are dissolved in solvent to make adhesive): Conservation Materials Ltd.

⁵Adhesive tubes: suggested sizes: 5/8 in. diameter x 4 in. (tin), mastus tip; 1 in. diameter x 6 in. (aluminum) nasal tip. Unipac Supply Co., P.O. Box 98026, Pittsburgh, PA 15227, Tel. 412-885-2266

⁶Ethyl alcohol, or "ethanol," should be clean and clear. Hardware store quality or standard chemical grade. Do not use if it is colored.

Additional reading

Koob, S. P. 1986. "The use of Paraloid B-72 as an adhesive: Its application for archaeological ceramics and other materials." *Studies in Conservation* 31:7-14.

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Paterakis, A. B. 1987. "Deterioration of ceramics by soluble salts and methods for monitoring their removal." In *Recent Advances in the Conservation and Analysis of Artifacts*, compiled by James Block, 67-72. London: Summer Schools Press.

Sease, C. 1994. *A Conservation Manual for the Field Archaeologist*, third edition. Los Angeles: Institute of Archaeology, UCLA

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