



Conserve O Gram

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Desalinization: Passive Alkaline Soak

Metal objects recovered from salt water or from salty soils are almost always contaminated with corrosion-stimulating chloride ions. These objects can continue to corrode, even in a controlled museum environment of 45 to 50% relative humidity (RH). Iron objects are particularly vulnerable. If left untreated, they can be stabilized only by putting them into a very dry environment of below 30% RH.

Conservation treatment attempts to stabilize iron (and sometimes copper alloy) objects by removing the contaminating chlorides. One method of removing chlorides involves washing them out in successive baths of strongly alkaline water. However, this may not be appropriate for certain objects, especially if the metal is attached to non-metallic material, such as wood, bone, glass, or textile. The condition of the metal is also relevant. For example, soaking may not be an appropriate treatment for crumbling, friable metal. In any case, treatment should only be attempted under the direction of a conservator who has knowledge of the object and its condition.

Procedure

1. Remove as much of the adhering soil and encrustation from the object as possible by brushing it under running fresh water and chipping and picking at the crusts. Use fine stainless steel brushes on iron, fine brass brushes on copper alloys. Take care not to damage any surviving features such as paint, plating layers, or patterns of lost objects preserved in the crusts. Keep the object wet; do not allow it to dry.
2. Submerge the object in a tank filled with tap water to which has been added enough sodium hydroxide or sodium carbonate to make a strongly alkaline solution with a pH in the range of 11 to 12. This can be achieved with a solution of 2% sodium hydroxide or 5% sodium carbonate. (Refer to *Conserve O Gram* 6/4 for information on mixing solutions.) Change the solution *weekly*. (Dispose of solutions in accordance with local environmental or hazardous waste regulations. Consult the park safety officer. The pH of the solution must be reduced to below 10 by addition of a mild acid before the waste can be poured down the drain.) Keep the tank covered.
3. After two months of weekly changes, make up new solutions on a *monthly* basis.
4. Test the baths for chloride concentration at the beginning and end of each soaking period, following procedure in *Conserve O Gram* 6/3. With each change of solution, the chloride levels reached by the end of the period should decline with respect to the levels of the period before.
5. Test the fresh tap water. When the chloride levels in the month-long soaking solution decline to the same levels present in the raw tap water stock, use deionized or distilled water instead of tap water.
6. When the chloride levels at the end of a month of alkaline soaking are the same as those at the start, and remain so for three successive changes, the process may be

- considered complete. Chloride levels should be no more than the 10 ppm present in the sodium carbonate or sodium hydroxide.
7. Soak the object one week in a new bath of deionized or distilled water to help remove residual alkaline material. Use a wire brush to remove rapidly appearing fresh corrosion. Rinse under running deionized or distilled water.
 8. During the drying of the object, assist dehydration by passing the object through three successive baths of alcohol mixed with water, starting with an alcohol-to-water mix of 3 parts water to 1 part alcohol. The second bath can be 1 to 1 alcohol:water, the third bath 3 to 1 alcohol:water. Follow with a fourth and final bath in 100% acetone (extremely flammable). Soak the object for one day in each of the four baths. Air dry the object for at least one week following the baths.
 9. Final surface finishing is done using wire brushes, hammers, or picks to remove flash rust or crusts not previously removed. Pick up fine dusty residues by using a cloth dampened with Stoddard solvent or ethanol.
 10. The final protective coating system will depend upon the intended location and use of the object, whether it will be displayed outside or inside, and what the environmental conditions will be. Possible protective barriers include wax or a paint system such as an inorganic zinc primer with polyurethane top coats. Consult a conservator for advice for each particular situation.
 11. Treated objects may still have some residual chloride contamination that can be re-activated by elevated RH. Therefore, the recommended level for storage and exhibit is below 40% RH.
 12. **NOTE:** Untreated chloride-contaminated metal objects should be kept at very low RH, below 30%. They also should be isolated from uncontaminated objects; store untreated objects in separate cabinets, or wrap them in polyethylene so that salty crusts and dust are confined.

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