

Archaeological Preservation Research Laboratory Report 3:

Re-treatment of a PEG Treated Composite Artifact - A Sabot

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The purpose of this article is to discuss a very effective process developed at APRL to stabilize composite artifacts that had initially been preserved using polyethylene glycol (PEG).

Background Information:

Exhaustive studies have been undertaken to investigate the technological advancements made in the American Civil War era. An interesting adaptation to spherical case ammunition during this period is the sabot, a wooden, flat based attachment that allowed better positioning of the ammunition and fuse within a gun.

Familiar with the scope of APRL research, Anne Lessman of the Vermont Maritime museum contacted APRL concerning the possibility of stabilizing the wooden portion a sabot so that all of its component parts could be re-assembled for display. She provided APRL with a sabot for assessment, re-treatment and evaluation. This waterlogged artifact had been disassembled into its component parts: its wooden base, its attachment straps, and its round cast shot. The wooden base was initially treated with PEG and appeared to generally be in good condition, but its surfaces felt very soft and damp due to what appeared to be a high concentration of PEG. Unfortunately, no conservation notes were available making it nearly impossible to determine what percentages and weights of PEG had been used to to preserve the sabot. Data was collected prior to re-treatment for analysis.

Figure 1 Although the illustration to the right is of a later sabot than the one used in this experiment, it clearly illustrates our sabot form and composite construction(After Hogg, 1974).



Previous experimentation conducted at APRL that has enabled the development of a procedure involving the removal of free-flowing PEG and the stabilization of remaining bonded PEG within the cellular structure of an artifact is outlined in Report 2 of the APRL conservation series. One benefit of this treatment strategy is its ability to remove the dark coloration and greasy texture often associated with PEG treatments. This re-treatment strategy is not capable of returning waterlogged, PEG treated wood to its exact original coloration, because water logging processes and PEG treatment irreversibly effect the coloration of an artifact. But as noted in Report 2, APRL re-treatment strategies have had much success returning preserved artifacts to a state that is substantially closer in coloration to control specimens which represent the original color of the wood. Certainly, this coloration is much more realistic and wood-like in feel and texture than what is produced using PEG preservation alone. Additionally, following re-treatment, these "hybrid" PEG treated artifacts do not appear to be sensitive to humidity and temperature variations. Initial testing suggests these treatment strategies may be substantially better for composite artifacts such as our sabot, its attachments straps and its round cast shot. Figure 2 is a photograph of the sabot prior to re-treatment. Note the dark coloration of the wood.



Figure 2 PEG treated sabot prior to re-treatment.

Methods:



The basic methodology outlined in Report 2 was used in the re-treatment of this artifact except that due to its size, larger containers and volumes of chemicals were necessary. The sabot was placed into a large plastic container, immersed in a volume of methyltrimethoxysilane (CR-20 Passivation Crosslinker). CR-20 acts to remove free-flowing, and nonessential PEG. A loose fitting top was positioned over the container and then, the artifact in solution was placed into a well vented warming oven that had been preheated to 70 degrees Celsius. The artifact was left in treatment for approximately four and a half hours. Figure 3 illustrates the setup used for this procedure.

After heated immersion, the artifact in solution was removed from the oven and placed in a well ventilated fume hood where it was allowed to slowly return to room temperature over a one hour period. The sabot was then removed from the CR-20 Passivation Crosslinker, briefly surface wiped with soft, lint free cloths and placed on a tray in the fume hood and allowed to air dry over night in flowing fresh air.

Figure 3 The sabot in treatment, immersed in CR-20 Passivation Crosslinker Passivation Crosslinker in a well ventilated oven.

The following morning, it was removed from the fume hood and inspected. The first notable change was that the artifact was no longer greasy and wet. The coloration of the artifact had also changed to a much lighter hue. The upper edge of the sabot, which is very thin in structure, felt firm after treatment. Three nail holes in the upper sides of the artifact, which had been used to hold the attachment straps for the sabot appeared to be somewhat elongated. These holes were noted prior to treatment but because of the dark

coloration and the slightly swelled nature of the wood, their elongated nature was not obvious. Figure 4 is the completed sabot after 24 hours of air-drying.



Figure 4 The completed sabot

Comparative analysis of pre and post treatment data indicates no dimensional changes resulting from re-treatment. This was a surprise. One result noted in Report 2 was that PEG treated waterlogged wood had swells significantly as compared to control samples. This swelling was indeed, induced by the fact that the waterlogged wood samples were heavily bulked with PEG 3350 (approximately 58%). The degree of treatment and types of PEG used on the sabot are not known owing to the lack of a conservation record. Two possibilities may explain why there was no structural changes as the result of re-treatment. First, it is possible that the artifact was treated with a substantially lower percentage and/or molecular weight of PEG. This would most certainly alleviate some of the swelling associated with higher percentage treatments. Obviously, since we have no way of know how much swelling may have occurred as a result of this artifacts initial treatment, it is impossible to know what degree of swelling is generally associated with this artifact. In any respect, it appears to have remained structurally stable following re-treatment.

References:

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