

## Preservation of Metal Artifacts at Hazara University Museum: A Strategic Approach to Prolong the Life of Cultural Heritage for Future Generations

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### ABSTRACT

The study is discussing the strategic approach for preservation of a number of metal artifacts housed in the Hazara University Museum. The artifacts include utensils, locks, weapons, jewelry, lamps, coins and nails made up of various metals like brass, silver, copper and iron. The analysis and data tabulation revealed that most of the artifacts possess corrosion effects where, some were effected fully and some were partially corroded. A number of strategies have been proposed to prevent the artifacts from further corrosion and deterioration. The suggested strategies are classified as per metal or alloy from which the artifacts had been made. More emphasize has been given on the strategies that are mostly reversible, non-destructive and preventive so that the chances of deterioration are minimized and long-term preservation is achieved. By the end of each process, the proper technique for coating of the artifact is proposed to mitigate the threats that might be caused by environmental factors such as temperature, relative humidity and pollution.

**Key words:** Preservation, Artifacts, Corrosion, Museum, Environment

### Introduction

Most of the metallic artifacts face corrosion especially those kept in damp conditions in the museums. Corrosion deteriorates the metal as time passes and eventually the artifacts lose their identification and recognition, which lead to the loss of important

archaeological data. The present study is a work to present a strategic plan including the chemical technique for cleaning and preventing the artifacts housed at the Hazara University Museum from further decay and to prolong their life for the inspiration of future generations. The causes of the decay may be different for example, chemical reactions of metals with moisture, acidic conditions and growth of proils that may occur naturally on the surface of metal artifacts which has been proved very damaging for the metallic artifacts (Gaylord, 2006).

To overcome the damage, it is unavoidable to investigate the cause and then prevent the artifact from the disease. It is also necessary to determine the three preliminary points i.e. from which metal the artifact was made? What was the condition of the artifact when it was buried? And in what condition the artifact was found? All the three questions are must for proposing a proper strategy for preserving the metal artifacts in the museum (Jim Spriggs & Sonia O'Connor, 1996). The most fragile metal artifacts may be damaged with mechanical and chemical cleaning therefore, most of the archaeological conservation experts suggest to control the environmental factors such as moisture, humidity, etc. rather than to apply such damaging chemical and mechanical techniques. For the aforementioned reason it is suggested to prefer the stabilization over any other treatment for preserving the metal artifacts (Watkinson, 2010).

Metal artifacts housed in the Hazara University Museum possess corrosion effects which have been caused mostly because of the environmental conditions of the area. The present study focuses on the documentation of the historical importance, investigation of present condition, studying the corrosion effects and proposing the best suitable technique for proper preservation of these metal artifacts to prevent them from further deterioration.

## Methodology

The methodology used for the present study include primary as well as secondary resources. The literature has been studies extensively to correlate the problem with that occurring globally. A reasonable sample size of twenty-three artifacts has been selected for the study. The judgement sampling technique has been followed to represent each and every category housed in the museum (Sinopoli, 1991). Each and

every artifact has been studied with special reference to its environmental conditions. Photography is a media that can reconstruct the process and has significance for archaeological study. Photographs are important documents for research and also for the archival record that may be helpful for the future studies. All the samples were photographed completely for the publication and comparison.

The existing record of the material has been studied including the accession and catalogue register of the Museum. Each artifact has carefully been observed. All the artifacts were classified on the basis of material from which these have been made. Then proper preservation strategy has been proposed for each group of artifacts starting from cleaning, stabilization, and coating.

## Results and Discussion

All the selected artifacts have been divided in to four categories according to the material from which these are made i.e. Brass, Silver, Copper and Iron. The present condition of each artifact and its detail is available in the appending table. According to the material and the current condition, the proposed preservation strategy of each category is as under:

### Preservation Strategy for Brass Artifacts

Brass is an alloy made up of two third part of copper with one third of zinc. The proportion may vary according to the end use and the desired color. The most common problem the brass artifacts face is corrosion, dents and over cleaning. The over cleaning especially by rubbing leaves the friction marks on the surface. Brass artifacts can be prevented from corrosion by making sure to keep it in the non-drastring conditions like not too cold, hot or damp. It can be prevented from dents by ensuring the careful handling and by preventing it from dropping down. Similarly, over cleaning can be reduced by ensuring that the artifacts should not be handled without wearing the plastic gloves as the salts and oil present on the skin may cause it to tarnish. Basic cleaning with care may enhance the appearance by removing dirt and corrosion and by removing the finger print marks. Polishing of any kind should be avoided as it brings back shine to the artifact but by revealing the fresh metal underneath. Over polishing may cause the loss of decorative details on the surface of brass artifact (WMT, 2017).

Brass surface may be cleaned by following the three step process: Firstly, soft dry cloth and old nylon toothbrush can be used to remove the dust from all the crevices. Any kind of house hold spray should be avoided as it may react with the material and may cause adverse effects. Secondly, any kind of dirt, whether soil-based or oil-based, can be removed using soft cloth with distilled water and a detergent with neutral pH. After removal of the dust the artifact must be rinsed with the distilled water and then dried at optimum temperature. Thirdly, for removing the greasy smears, the surface of the artifact can be treated by wiping white spirit over the surface with a lint free cotton rag following by rinsing with the distilled water and dried in an optimum temperature.

The cleaning may be followed by non-chemical polishing afterwards. The polishing may be done using fine abrasive cloth such as micro-mesh. After the proper cleaning waxes or lacquers can be applied as protective coating to avoid corrosion in future. If some touch ups are required on various parts of the artifacts, some acrylic based lacquer like Incralac can be applied with soft brush. If old lacquer is faded the micro-crystalline waxes can be applied on top of the old lacquers following by proper cleaning with lint free cotton rag (Faraldi et. al., 2017; WMT, 2017).

## **Preservation Strategy for Silver Artifacts**

Silver artifacts are mostly prone to Sulphur and its compounds therefore, long term contact of the silver artifacts with protein-based materials such as wool, silk or leather while choosing materials to store or display as these compounds contain Sulphur. Sulphur absorbing materials like charcoal cloth, silver safe or copper-impregnated plastic films may be used to slow down tarnishing. While handling the silver artifacts, clean cotton gloves should be used. Silver artifacts should be kept clean and dust free as the dust particles may attract moisture and initiate the corrosion cycle. Cleaning may be done by using soft, clean, lint-free cloth or a very soft brush. The artifacts should be kept in dry and well-ventilated environment as the moisture initiates and propagates the corrosion process.

The removal of tarnish from the silver artifacts can be divided in to two categories. Firstly, if the tarnish is light, it may be removed with the commercial silver cleaning

cloth which will remove the dust and greasy deposits and the dulling tarnish, resulting in a bright polished look of the surface. Secondly, if the tarnish is heavy, a liquid method such as “silver dip” may be effective which works by dissolving the tarnish chemically. The treatment results in a very reactive silver surface which may tarnish again suddenly. This can be avoided using silver polishing cloth after the treatment. While cleaning with the chemical, fresh solution should be prepared every time and post cleaning should be done with silver cloth. While cleaning the silver artifacts, wadding, creams and rouge sticks should be avoided as these contain abrasive compounds. Similarly, brass or chrome cleaners and electrochemical processes should be avoided on silver as these may effect adversely on the material as well as on decoration. After cleaning of the tarnish or corrosion the silver artifacts may be protected by finishing with lacquer spray which is usually cellulose nitrate dissolved in organic solvent (Icon, 2025).

### **Preservation Strategy for Copper Artifacts**

The copper artifacts should be consolidated with acrylic resins before cleaning due to fragility of some areas. Mineralized wood, bone or horn usually badly adhere to the surface of fragile borders which may be unable to support the mechanical cleaning. Before treating the corrosion chemically, the nature of the corrosion product may be identified through qualitative analysis in which some acid drops are poured on the corroded surface and identification is done through spot test analysis. The cleaning may consist of removing dust, organic and inorganic concretions from surface of the artifacts. The process may be started with dry mechanical systems i.e. scalpels, brushes and micro drills supported by wet mechanical methods. Cleaning under the microscope may also be taken in to account in order to avoid scratching. Old treatments must be removed during the cleaning before applying the new ones. The objects should be desalinated after the cleaning for proper stabilization for which B70 system is prepared. It consists of the application of two baths: the first one consists of 90% methanol, 6.8% de-ionized water and 3.2% ammonia. This bath is used to remove chlorides from the surface. The second bath consists of 90% methanol and 10% hydrogen peroxide which forms an oxide layer on crops holes. The process should be repeated several times for making it effective (Lois et. al.,

2020).

Another method called Organ Method may also be used which consists in the mechanical removal of the chlorides and introducing silver oxide mixed with ethanol in to the out crop holes. Then artifact is placed in a humidity chamber for 24 hours in order to form silver chloride which is a stable component. The stabilization may be followed by inhibition in which a proper inhibitor is used which delays the corrosion process and the surface is safe for long period (Cano & Lafuente, 2013; Lois et. al., 2020). After inhibition artifacts are protected with warm acrylic resin bath at 40°C diluted in an aromatic hydrocarbon. Finally, a warm coating of microcrystalline wax diluted in an aliphatic hydrocarbon should be applied to make the surface water repellent. For optimal preservation, metals should be stored in the conditions with temperature around 20°C and relative humidity not higher than 35-40% (Diaz & Gracia, 2015; Lois et. al., 2020).

### **Preservation Strategy for Iron Artifacts**

First of all, dust must be removed from iron artifacts. It is better to use vacuum cleaning with a very soft brush preferably; a bristle brush should be used to clean the crevices. If wet cleaning is required, deionized or distilled water should be used to avoid the contamination of salts which enhance the corrosion (Clara, 1977). The presence of degraded oil and grime promote the corrosion. Mineral spirits may be used to degrease the metal if it is uncoated. The surface should be wiped first at very small area to test for discoloration. The continuous cleaning with the spirit help to lift the grime. If the process does not work, the conservation-recommended surfactants like Vulpex or Ovus should be used. Vulpex is used with its 1% solution in spirit while Ovus with it 3% solution and then making the proportion with 50/50 in water. Corrosion may be removed mechanically and then inhibitor is applied to prevent the artifact from attack of corrosion. If the corrosion is non-removable, then it should be stabilized with the help of latex-based coating. The most traditional and recommended coating for the iron artifacts is stove black coating. Other kind of coating materials like lacquering, painting and waxing may also be used to preserve the iron artifacts for long time (Plenderleith & Werner, 1971; MacLeish, 1972; Clara, 1977).

## Conclusion

Twenty-three artifacts made up of different metals i.e. Brass, Silver, Copper, and Iron were selected among the huge number of artifacts housed at the Hazara University Museum. The material, character and present condition of each artifact have been studied carefully. After thorough study of the literature the strategy for proper cleaning, and preservation of each kind of artifact has been suggested. The suggested strategies are classified as per metal or alloy from which the artifact had been made. More emphasis has been given on the strategies that are mostly reversible, non-destructive and preventive so that the chances of deterioration are minimized and long-term preservation is achieved. By the end of each process, the proper technique for coating of the artifact is proposed to mitigate the threats that might be caused by environmental factors such as temperature, relative humidity and pollution. By applying these techniques at the artifacts of Hazara University will not only prolong the life of cultural heritage for future generations but also enhance the aesthetics of the exhibits, resulting in the visitors' satisfaction and repeat visits.

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## Appendix: Metal Artifacts housed at Hazara University Museum

| Artifact (HUM) | No. | Artifact detail                                                                                                                                  | Description                                                                                                    |
|----------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 00119          |     |  <p>Pl. 1: Brass Metal Jug</p>                                  | The current condition of brass jug is good but it has corrosion on different parts.                            |
| 00159          |     |  <p>Pl. 2: Brass plates with decorative borders</p>            | The current condition of brass plates is fade and these plates have corrosion effects on different parts.      |
| 0017           |     |  <p>Pl. 3: Brass Jug highly decorated with floral motives</p> | The current condition of brass jug is fade and most of the parts have corrosion.                               |
| 00241          |     |                                                               | The current condition of these silver table spoons is fade and most of the parts of the spoons have corrosion. |

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|       | Pl. 4: Silver table spoons                                                                                                     |                                                                                                   |
| 0019  |  <p>Pl. 5: Silver rectangular coin</p>        | The current condition of ancient rectangular coin is fade and it has corrosion most of the parts. |
| 00136 |  <p>Pl. 6: Copper Octagonal shape pandon</p> | The current condition of pandon is good but it has effected through corrosion.                    |
| 00172 |  <p>Pl. 7: Round shape copper pot</p>       | The current condition of pot is good and it has no corrosion effects.                             |
| 00347 |                                             | The current condition of copper axe is not good and it is full with corrosion in all parts.       |

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|       | Pl. 8: Small copper axe                                                                                                            |                                                                                     |
| 00348 |  <p>Pl. 9: Copper hooking bell</p>                | It is not in a good condition and filled with corrosion.                            |
| 00376 |  <p>Pl. 10: Small copper decorated inkpot</p>    | Current condition is not good because it is filled with corrosion.                  |
| 00264 |  <p>Pl. 11: Copper Anti mini pot with stick</p> | It is not in a good condition and it has corrosion effects most of the parts of it. |
| 00400 |  <p>Pl. 12: Copper button</p>                   | The current condition of copper button is not good because it has corrosion.        |

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| 00513 |  <p>Pl. 13: Copper bangle</p>         | The current condition of the round shape bangle is critical because it is filled with corrosion.     |
| 00546 |  <p>Pl. 14: Copper plate</p>         | The current condition of this ancient metal artifact is not good rather it is rusted.                |
| 00162 |  <p>Pl. 15: Copper big size pot</p> | The current condition of the copper pot artifact is fade and has corrosion on different parts of it. |
| 0017  |  <p>Pl. 16: Square copper coin</p>  | The current condition of this ancient coin is fade and this artifact has some corrosion effects.     |

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| 0046  |  <p>Pl. 17: Iron tripod stand</p>       | It is in good condition but rusted.                                                                  |
| 00312 |  <p>Pl. 18: Iron arrow head</p>        | The current condition of iron arrow head is fade and it is filled with corrosion due to environment. |
| 00279 |  <p>Pl. 19: Iron lock with key</p>    | It is in good condition but some parts of the iron lock have corrosion.                              |
| 00507 |  <p>Pl. 20: Iron Large spear head</p> | It is rusted because of corrosion all over it.                                                       |

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| 00379 |  <p>Pl. 21: Small iron pot</p>  | The artifact is not in good condition and have corrosion on all parts of it.                |
| 00378 |  <p>Pl. 22: Iron small pot</p> | The current condition of the artifact is not good.                                          |
| 00383 |  <p>Pl. 23: Iron lamp</p>     | Iron oil lamp is not in a good condition because it has corrosion on different parts of it. |