

## **Brass Patina Techniques: An Experimental Approach**

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### **ABSTRACT**

Through this paper researcher will try to meet the needs of sculptors and craftsmen who create articles in brass, and then as surface treatment who wish to do patina. Which can be done through chemicals to achieve different colors on brass, that give a natural aging or antique look to the art piece, by utilizing the reactive nature of brass. This paper is a documentation of an attempt to achieve different colors of patina through chemical reactions and oxidation process on brass by experimentation. Along with the preservation technique of brass patina. So, this is experimental research for the field of visual art (sculpture) by the support of science (chemistry), one more example of relation between Art and Science.

### **KEYWORDS:**

patina, techniques, patination, metal, brass, sculpture, surface treatment, method, chemicals, reactions, chemicals recipes, preservation, process.

### **1.0 INTRODUCTION**

Meaning of Patina

Patina literal meaning is a film of oxide formed on the surface of a metal (produced by oxidation or other chemical processes)

“Metal sculptures get platinized due to its prolonged exposure to different weather condition. But this effect is uncontrolled, that spoil the metal. To preserve the metal and to create controlled patina the sculptor gives its various chemical treatments.” By C.S.N. Patnaik

This paper is a documentation of an attempt to achieve different colors of patina, through experiments with chemical reactions and oxidation process brass by experimentation. Along with the preservation of brass patina from further corrosion.

Patina is same as face make-up of a lady, both beautifies or enhance the contours of each, aesthetically important for both. But in sculpture it refers to a naturally matured surface that shows the effects of ageing and the elements depth, such as those shown on ancient sculptures recovered from the ground or from the sea. Those taken from the water have gained a patina that is the result of prolonged exposure to salt water and to the working of various crustaceans.

The oldest and simplest method of patination is to bury the metal object in the ground or in a sand pit for a long period of time. The surface will oxidize according to its alloy and the acid or lime content of the soil or sand. The soil chemistry can be altered by mixing in animal manure, or by adding urine. But that takes a lot of time weeks or even months. So, the most

commonly practiced process is patination achieved by applying chemicals, because it saves time and it's also gives a variety in colors of patina, that can be done in controlled manner.

## **2.0 Aims and methodology**

### **2.1 Aims**

This paper is an attempt to achieve different colors of Patina through chemical patination process by experimentation. Along with the preservation of brass patina from further changes. Researcher will try to meet the needs of sculptors and craftsmen who create articles in brass by presenting different techniques of patination on brass, which includes patination through chemicals to achieve different colors of patina, which give a natural aging or antique look to the art piece, by using the reactive nature brass.

### **2.2 Methodology**

Research conducted as experimental research because the nature of the study is lab experiments. As the researcher know qualitative research is collecting, analyzing and interpreting data by observing the experiment outcome.

- a) selection of independent variables
- b) conducting the experiments
- c) collecting data through documentation
- c) analyzing the data inference

Modern terminology is adopted throughout, to avoid the confusion caused by archaic chemical names and systems of weights and measures. the process for metal patination is, as it has traditionally been, in the field of fine art, sculpture. we hope that this collection of recipes and techniques, and the test results illustrated in the color plates, will give some idea of the potential of brass surface treatment and patination for the artist sculptor.

## **Sampling**

### **Independent variable**

Independent variable are those chemical compositions or recipes that are changed or controlled in a scientific experiment to test the effects on the dependent variable i.e. cast brass test plates (Figure 3-5, shown below)

### **Basic procedure**

In this research the principal applications for metal surface treatment and patination which have traditionally been done, in the fields of fine art metal works and sculpture were followed.

## **Preparation of surfaces for patination**

Metal surface treatment and patination are that processes which can be considered in isolation from the overall surface quality of an object. it is important that the surface to be colored is carefully prepared, whether finely polished, abraded or textured. Patination will not conceal defects in the surface. often the quality of the finished surface is enhanced by preparation involving the use of texture, and many effective patinated finishes use the contrast between colored areas and areas of exposed metal as the basis for decorative treatments. in addition, features of the surface that are undetectable in a polished finish, such as the grain structure, may be revealed by the process of patina.

Structure and surface one inherent difference that is of significance in patination is the difference between the nature of rolled sheet materials and cast materials. we are used to being able to obtain sheet materials in inventory thicknesses, with good surface finishes, carefully controlled compositions and a resulting high level of consistency in working properties. these characteristics of modern sheet metal inventory have been carefully developed by manufacturers in order to provide industry and the crafts with materials which can produce controlled and predictable results. on the other hand, we are also used to the idea that with cast materials, although the composition of the ingots used can be accurately specified, the quality of the result depends to a large extent on the casting process used, the design of molds, and the skill with which the process is carried out. however, when cast and sheet materials are ground and polished, they may appear to be closely similar. although metals presented in this form appear homogeneous to the eye, they do in fact have a distinct grain structure, whose exact form depends on the processes which the material has undergone. modern production processes result in sheet materials that have a very fine even grain structure, of a scale that makes the grain invisible to the naked eye, even after suitable surface treatment.

## **Cleaning of surface of metal before application of patina**

Even and spot-free Patina can only be obtained on clean metal surfaces that are entirely free of grease. any residual grease, including fingermarks. will inhibit patina locally and give rise to unevenness, marks and spots that mar the finish. the polishing stages in the surface preparation of metals normally includes the use of grease-bound polishing compounds. General degreasing and the removal of these compounds can be carried out by several methods including treatment with alkaline degreasing agents or with organic grease-dissolving agents. in commercial applications the metal is either immersed in hot alkaline degreasing agents or sprayed with them. organic grease-dissolving agents.

## **Preparation of patina recipes**

Solutions are prepared either by dissolving solids or by the dilution of concentrated liquids. As a rule, it can be stated that solids or liquids should be added in small amounts to relatively large quantities of water, and not vice-versa when preparing solutions. This is essential when diluting or dissolving concentrated acids and alkalis. Also, its suggested to use distilled battery water instead of normal water because it may contain some salts which can change the chemicals properties shall be use as patina recipe.

The surface of the object to be patinate must be thoroughly grease-free prior to treatment. Even small traces of grease will stubbornly resist patina and are difficult to eliminate without

marring the surface once patina is underway. Patina is generally easier to achieve on as-cast rather than polished surfaces. Polished surfaces may be bristle-brushed with pumice and then thoroughly washed in cold water. This provides a slight ‘tooth’ to the surface, which assists in breaking down surface tension and obtaining a more positive effect when the patina recipe is initially applied. It also provides a final mechanical cleaning stage which helps to ensure that any surface contamination is removed, immediately prior to application of patina.

**Application technique of patina by brushing**

An alternative method of the nineteenth century, is carried out by applying and thinning the solution with soft bristle-brushes (shown in Fig.1). The solution is first brushed on so that the whole surface of the object is wetted, a dry brush is then used to thin out the solution on the surface with light rapid strokes in all directions. When the brush becomes too moist to be effective a further dry brush is used and is replaced as necessary until the whole surface is nearly dry, the object is then left to dry completely before the next application. the brushing application was often carried out while the object was gently warmed on a hotplate or by sunlight. This technique tends to produce a surface with a powdery appearance and although it can produce results more quickly than by wiping, requires considerable practice to perfect.

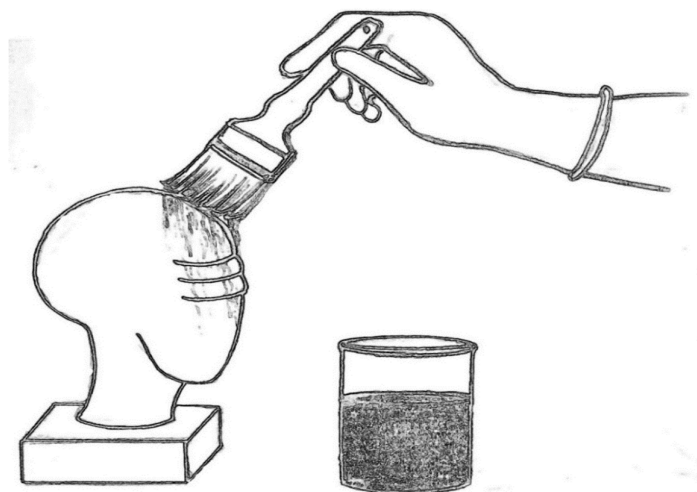


Fig 1. Application technique of patina by brushing

**Application technique of patina by spray**

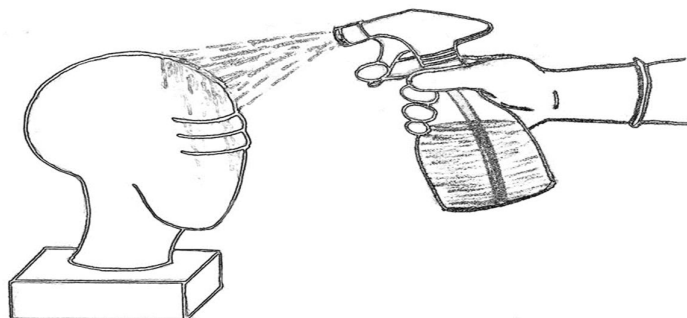


Fig 2. Application technique of patina by spray

A more recent method of application consists of spraying the surface of the object with a fine mist of solution and allowing it to dry before a further application (shown in Fig.2). this process is repeated until the patina has developed. no specialized spraying equipment is required, as a fine mist can be obtained with readily available hand-held pistol grip sprays as used by gardeners for insecticides. these are made of plastic that is resistant to the range of chemicals that are suitable for use in spray treatments. the fine-bore tubing and filter used in these hand sprays should be thoroughly cleaned after use. the success of the technique depends to a large extent on the care with which it is carried out, if the spray is applied unevenly or too liberally, then the solution tends either to pool or stream, depending on the orientation of the surface.

This results in uneven streaks and patches in the final patina. ideally the surface should become coated with a mist of fine droplets. Some specialized chemical compounds are available which can help to achieve this. very small additions of an organic silicon compound (a silicone) or of trimethyl hexanol have the effect of retracting the solution into droplets of an even size and tend to prevent pooling and streaming. additions of these chemicals have been used commercially in the artificial patination of copper roofs, and results are reported to be good.

### **3. THE TEST PLATES AND THEIR RECIPES**

#### **1. Brass plates and their patina recipes**

Before the application of any recipe, the article must be preheated through sunlight, it gives instant result.

After the chemicals application when desired color achieved its recommended to apply wax polish or liquor coat, otherwise patina of that article may get change due to the further oxidation.

The brass to which the recipes and result refer is (55% copper,45% zinc) commonly used as a general-purpose casting. Brass with a significantly different composition may leads to give different result in some cases.

#### **Brass 1. Black with pink spots (Fig.3)**



Copper nitrate	50 ml
Hydrogen peroxide sol.	50 ml
Vinegar	50 ml
Sodium chloride	50 g
Water	250 ml

Note- vinegar which commonly used for cooking porous.

**Brass 2. Dark brown (Fig.4)**



Ferric nitrate	50 g
Potassium sulfide	35g
Barium sulfide	100 g
Ammonia sol.	50 ml
Water	250 ml

**Brass 3. Basic brown (Fig.5)**



Ferric nitrate      25 g  
Water                250 ml

**Brass 4. Sky blue (Fig.6)**



Hydrogen peroxide sol.      50 ml  
Ammonia sol.                50ml  
Cooper sulphate                25 g  
Sodium chloride                25 g  
Water                              250 ml

**Brass 5. Yellow ocher (Fig.7)**



Ferrous sulphate	25g
Copper nitrate	50ml
Ammonia sol.	50ml
Water	250ml

## Finishing

When patination is complete, the object should be left to cool and dry out thoroughly before wax finishing. It is sometimes suggested that wax should be applied while the object is still hot, as this facilitates its application, but this practice is not recommended. After the chemicals application when desired color achieved it is recommended to apply wax polish or liquor coat, otherwise patina of that article may get change due to the further oxidation, causing imperfections which are difficult to remedy. It is generally better to allow the object to cool completely and dry and then apply the wax in the normal way, after moistening with pure turpentine.

## Safety in Patination

There are two aspects of safety which need consideration. firstly, there are the inherent properties of chemicals and their interactions, which may give rise to dangers because the chemicals or their products are toxic, corrosive or harmful in various ways. information relating to the use of a chemical in a specific recipe is included in the notes that accompany that recipe. The more general properties and interactions of chemicals that are potentially hazardous are given in the list of chemicals and hazards. The other aspect of safety is more general, but equally important, and concerns the preparation of chemicals and their use in the workshop in the context of the different coloring techniques.

## Chemicals and their hazards

**Nitric acid:** A powerful corrosive acid which causes severe burns to the eyes and skin. If swallowed it would cause severe internal injury. It is also a powerful oxidizing agent and may cause fires if mixed with combustible materials. The vapor irritates all parts of the respiratory system and must not be inhaled. The vapor also severely irritates the eyes and skin. Violent reactions can occur with a wide range of chemicals; acetic acid, ethanol, chromium trioxide, laminable liquids and gases. If strong solutions of nitric acid are added to copper or brass, then brown fumes of nitrogen dioxide are evolved, which are toxic and must not be inhaled.

**Copper sulphate:** Harmful if taken internally. Contact with the eyes and skin should be avoided

**Ammonia:** Ammonia solutions are corrosive and can cause severe burns. The vapor is very irritating to the eyes and all parts of the respiratory system. The solution burns the eyes severely, burns the skin, and will cause severe internal damage if swallowed.

**Ammonium chloride:** Harmful if taken internally.

**Ferrous sulphate:** Direct contact may cause severe eye and moderate skin irritation. Inhalation overexposure may cause irritation of the respiratory tract.

**Potassium sulfide:** Potassium Sulfide can affect you when breathed and contact can severely irritate and burn the skin and eyes with possible eye damage. Breathing Potassium Sulfide can irritate the nose and throat

**Barium supplied:** Harmful by inhalation or if swallowed. If it comes into contact with the skin, it should be washed off with plenty of water. Addition of acids will liberate toxic hydrogen sulfide gas.

**Ferric nitrate:** Irritating to skin and Irritating to eyes Sensitization

## **Conclusion**

The oldest and simplest method of patination is to bury the metal object in the ground or in a sand pit for a long period of time. The surface will oxidize according to its alloy and the acid or lime content of the soil or sand. The soil chemistry can be altered by mixing in animal manure, or by adding urine. Such a patina pit was a feature of some of the older art bronze foundries. Sculptors, however, do not usually have the time necessary to earth a sculpture for long periods, or to put it in the sea, to gain more natural patinas. Copper and its alloys (brass, bronze) corrode by chemicals reaction with the environment. The oxygen, sulfur and carbon dioxide in the air will change the copper surface into copper oxide, sulfide or carbonate. Chemical salts in the soil and ground water will change the pure copper surface into a patina layer of copper sulphates, sulfides, chlorides, nitrates, etc. Each chemical salt has its own color and texture, mostly green-blue. Moisture, acidity, sunlight, heat, contact with other metals and conducting surfaces as well as electric currents will regulate the level and quality of patina deposition and especially the rate of deposition. The most common patination is artificial and achieved by applying chemicals. Because it saves time and gives a variety in colors of patina, that can be done in controlled manner. These formulas are all best with warm to boiling water and will react quicker if applied warm or to a heated metal. The action of any of these formulae, when applied cold, can be speeded up by covering the metal casting with a plastic sheet. There is an old adage that says, "A thick patina covers a poor casting". Of course, the effect of texture and color are matters of personal choice and taste. Chemicals can also be painted roughly over the surface, or even splattered to make runs and blotches, but everything should be done with proper safety by taking precaution like gloves, breathing mask, eye protectors etc.

The subject of patination is almost impossible to treat with scientific exactness. Even if careful receipts and proportions of solutions are followed, the result will always depend upon the individual who applies these chemicals to the surface of the bronze, brass or gunmetal. The best way is to study the subject with an expert and make your own experiments under his guidance, until you achieve good result. Watch for accidental effects, and learn to stop in the, when you happen to get a suitable or handsome color. It may be preferable to patinate and color the surface with one of a number of chemical treatments to achieve a more subdued and subtler finish.

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