

## Effectiveness Of Metal Coating Using Electroplating, Electroless Plating And Hot Dipping In The Manufacture Of Weapons

**Andhika Kostrada, Jupriyanto, Timbul Siahaan, Rudy Gultom, Muhammad Taufiq Ramadhan**

Fakultas Sains Dan Teknologi Pertahanan, Universitas Pertahanan RI, Indonesia

e-mail: akostradaza@gmail.com, jupriyanto@idu.ac.id, timbulsiahaan57@yahoo.com

rudygultom@idu.ac.id, m.taufiqramadhan10@gmail.com

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### ABSTRACT

The process of coating weapons is important in the manufacture of weapons, because it can improve the quality, durability and corrosion resistance of these weapons. Metal coatings on weapons can protect the surface of the weapon from damage due to friction, corrosion and other environmental effects. In addition, metal plating can also enhance the visual appearance of the weapon, giving the weapon an attractive and aesthetic appearance. Coatings can also increase the durability of weapons against various environmental conditions and extreme temperatures. The process of coating weapons must be done carefully and requires a complex process and requires proper handling. Therefore, the choice of the right coating method is very important in the manufacture of weapons, because it can affect the quality and durability of these weapons. There are several metal coating methods that can be used in the manufacture of weapons, including electroplating, electroless plating, and hot dipping. The method used is done by collecting and analyzing data from sources such as journals, notes, articles, reports, and other materials related to metal plating using electroplating, electroless plating and hot dipping. In this study, the results obtained that electroplating coating is a coating process that is suitable for the defense industry, because it has several characteristics that electroplating has in the process of coating weapons, due to the need for weapons from resistance due to wear and corrosion, this can be a recommendation to the parties. the defense industry in the process of coating the metal of these weapons uses the electroplating process today.

### INTRODUCTION

Metal plating is the process of adding a layer of metal to the surface of an object using various methods such as electroplating, electroless plating, hot dipping, and so on. The purpose of metal plating is to improve the surface properties of an object, such as corrosion resistance, hardness, smoothness, and visual appearance (Apriliyanto, 2021).

Metal plating is often used in various industries, such as automotive, aeronautics, electronics, and more. Examples of commonly used metal plating are chrome to give a glossy appearance to metal surfaces, nickel to provide corrosion resistance, and copper to improve electrical conductivity (Sudana, 2017).

Metal plating on weapons has several main purposes, namely to increase corrosion and wear resistance, increase scratch resistance, improve aesthetic appearance, as well as increase the ability of bullets to penetrate targets (Purwanto, 2017).

Metal coating on weapons is not the only factor that determines the quality of weapons. The quality of weapons is also determined by other factors such as the material of manufacture, design and overall production quality.

In addition, there are some concerns regarding the use of metal-coated weapons, particularly in terms of health and the environment. The chemicals used in the metal plating process can be harmful to the health of the weapon user and the surrounding environment (Sirait, 2019). Therefore, it is important to ensure that the metal plating process is carried out correctly and in accordance with established safety standards.

## **METHODS**

The research method used in this study is research that relies on research methods that rely on literature studies so that this research method uses literature analysis techniques to review the effectiveness of coatings that are suitable for coating weapons from an economical perspective, efficient for the defense industry, especially in making decisions in coating weapons. In that comes from pre-existing sources. The main objective is to gain in-depth insight and understanding of themes or issues related to weapon plating.

This literature study method also collects and analyzes data from sources such as journals, books, notes, articles, reports, and other materials related to the topic of armor plating.

## **RESULTS AND DISCUSSION**

### **Metal Plating**

Metal plating is the process of adding a metal layer to the surface of an object to provide protection and improve the physical quality of the surface. Metal plating is generally done on base metals such as iron, steel, aluminum and copper, but can also be done on non-metallic materials such as plastic or wood (Suarsana, 2008)

Metallic coatings play an important role in a variety of industries, including the automotive, aviation, electronics, and others. In the automotive industry, metallic coatings are used to provide corrosion protection to automobile parts, while in the aerospace industry, metallic coatings are used to provide high temperature resistance and mechanical strength to aircraft parts (Basuki, 2022).

The purpose of metal plating varies, depending on the application. Some of the applications include corrosion protection, enhancing aesthetic appearance, increasing mechanical strength, increasing electrical conductivity, and providing resistance to high temperatures. Metal plating can be done using various techniques, such as electroplating, chrome plating, nickel plating, paint coating, and others (Permana, 2021).

While metal plating has many benefits, this process also has some drawbacks, such as high costs and the use of hazardous chemicals (Rohman Hakim, 2022). Therefore, electroplating technology is continuously evolving to minimize its negative impact and increase process efficiency.

### **Electroplating Coating**

Electroplating is a coating of gun metal which involves using an electric current to deposit a thin layer of gun metal on the surface of the metal object to be plated (Barry, 2016). This process involves electrolyte chemicals containing metal ions deposited on metal surfaces (Rosyidan, 2022).

Electroplating coatings are typically used to coat small items such as jewelry, wires and cables, and machine parts (Chang, 2022). Electroplating coating can provide several advantages to weapons, such as:

1. Added corrosion resistance

Electroplating coating can help reduce or prevent weapons from being exposed to corrosion or rust, thereby increasing the service life of weapons.

2. Better aesthetic appearance

Electroplating can give weapons a better look, especially if they have been damaged or scratched. Metal plating can help repair the damage and give it a like-new look.

3. Resistance to wear

Electroplating coating can help reduce or prevent wear on the surface of the weapon due to friction or friction with other objects (Wiratama Putra, 2023).

Then for the shortcomings of the coating process using the electroplating process are:

1. Cost

Electroplating coatings can be quite expensive depending on the type of coating used and the weapon to be coated. The price of electroplating can be more expensive than other coating methods.

2. Time-consuming process

The electroplating process takes quite a long time, depending on the size of the weapon and the number of layers required. This can render the weapon temporarily unusable.

3. Selection of the right chemical

To carry out electroplating, it is necessary to choose the right chemical so that the coating can work properly and not damage the weapon. Inappropriate selection of chemicals can cause damage to weapons and even endanger weapon users (Fahmi, 2021).

Electroless plating is a chemical coating method that does not require an electric current source (Wei, 2014). Conversely, metal particles are deposited on the surface of the weapon due to chemical reactions that occur in the electrolyte solution (Triyono, 2022).

In the process of coating weapons using electroless plating has several advantages and disadvantages, the advantages possessed by electroless plating include:

1. Even coating

Electroless plating provides an even and precise coating on the workpiece surface, even in hard to reach areas.

2. Easy process

The electroless plating process is easier and simpler than the electroplating method because it does not require the use of an electric current.

3. Does not require constant supervision

The electroless plating process can be carried out without constant supervision, so it can be done in large quantities at a relatively low cost (Fahmi, 2021).

Electroless plating also has several drawbacks including:

1. Not suitable for coating on all types of metal

Electroless plating is not suitable for coating all types of metals, and can only be done on certain metals such as nickel, silver, gold, copper and palladium.

2. Thinner coating

Electroless plating is usually thinner than electroplating.

3. Fees

Although the production cost of electroless plating is lower than that of electroplating coatings, the initial costs and equipment required to start the electroless plating process are higher.

4. Dependence on the quality of the chemical liquid

Electroless plating coatings are very dependent on the quality of the chemical liquid used, so the selection of the right chemical and consistency in quality is very important to ensure consistent and quality coating results (Kusumawati, 2022).

### Hot dipping

The hot dipping method involves heating the metal to be used as a coating until it melts and then dipping the gun into the molten metal (Beeley, 2023). This method is often used to coat iron and steel with other metals such as zinc or tin (Indarto, 2009).

There are advantages and disadvantages obtained from the hot dipping method, some of which have advantages:

1. Good corrosion resistance

The coating resulting from hot dipping is corrosion resistant, as the coating adheres firmly to the workpiece and provides outstanding protection against environmental elements such as moisture, air and chemicals.

2. Strong and durable coating

The coating produced from hot dipping is very strong and durable. This is because the coating process involves heating the metal until it melts making the coating adhere firmly to the workpiece.

3. Suitable for coating various kinds of metals

The hot dipping method can be used to coat a wide variety of metals, including iron, steel, aluminum, and copper.

4. Even coating

Hot dipping coating produces an even coating over the entire workpiece surface, even in hard-to-reach areas (Cahyanti, 2022).

The hot dipping coating method itself has several drawbacks including:

1. Rough surface

Hot dipping coatings usually have a rough, non-smooth surface and are not suitable for applications that require a smooth, regular surface.

2. Difficult to control

The hot dipping process is difficult to control and it is difficult to achieve an accurate thickness of the coating.

3. Not suitable for precision plating

Hot dipping coatings are not suitable for coatings that require very thin and precise coating thicknesses, such as coating workpieces that are very small or have intricate details.

4. Fees

The production cost of hot dipping coating is relatively more expensive compared to other coating methods (Krisdiyanto, 2023).

## CONCLUSION

The conclusion of this study is to know the effectiveness of the three types of metal coating weapons with the electroplating, electroless plating and hot dipping methods, so it can be concluded that the coating process using the electroplating method is a suitable coating method to do, because the process can be done for thin coatings, has resistance to wear, then resistant to corrosion. We cannot cover this in the process of coating weapons using electroplating which requires a large amount of money and takes a long time because it requires electricity and chemical compounds in it.

Then, from the research of this literature study, it can provide input to the industry, especially the defense industry, which requires coating weapons with a thin coating for wear and corrosion resistance, which can be done using a coating method using electroplating.

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