Objet Geometries

Metal Coating for PolyJet™ Models

Skill Level Time Cost

Overview

"Metal coating can be successfully performed on PolyJet models to provide a decorative finish or a hard surface for wear in various applications", says Mr. Paul Willment, Director of Morganic Metal Ltd UK. "Plating can improve physical properties of the Objet parts, such as tensile and flexural strength and the heat deflection temperature. Because of their light weight and Nickel ease of design, RP parts have been used in many applications to replace other alternatives".

Figure 1. Faucet model design by CAD

Product design of parts to be plated is particularly critical in determining the success of the plating operation, add Paul. Basic RP design practices should be followed to achieve a good molding in the unplated product, and it is advisable to have the design reviewed by the plater. Because the proper choice of resin for products to be plated is of basic importance, the resin supplier should be consulted while the product is in the design stage.

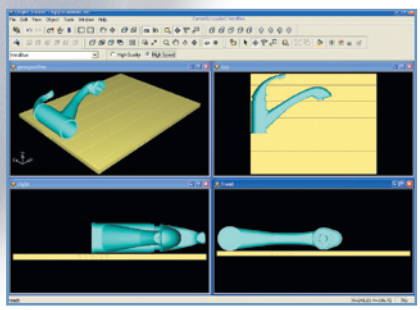

Figure 2. Model orientation in Objet Studio

Since PolyJet models are nonconductive, they must first be processed through a preplate cycle, during which a metallic coating is deposited by an electroless plating process to make the plastics part conductive. The preplate cycle consists of *etching, neutralizing, catalyzing, acceleration,* and *electroless plating*.

Etching

The etch bath consists of a highly concentrated acid solution of chromic and sulfuric acid. The solution oxidizes selective areas on the Objet part. The holes produced by the oxidizing action are absorbing sites that hold small metallic particles that serve as activators for electroless plating. The hole size influences adhesion and other physical properties. After etching, the plastic is thoroughly rinsed.

Neutralizing (sensitizing)

The neutralizing bath containing mild acids or alkaline solutions chemically neutralize the acids from the etching bath.

Catalyzing

In this step, a catalytic film is put on the oxidized surface to prepare for electroless metal disposition. It is done in two steps, in step 1 the liquid is immersed in a bath, step 2 involves another solution that prepare the Objet model to be plated by nickel.

Acceleration

The accelerator bath removes the entire chemicals that remain after the Catalyzing procedure. It also accelerates the catalytic film, to ensure a rapid coverage of electroless deposits.

Electroless Plating

The plating bath is the final bath of the preplate cycle. A thin deposit of metallic file is deposited on the Objet part. It can be made of nickel or copper depending on the objects application. Electroless plating helps electroplated parts in a corrosive environment.

Plating

There are many kind of ways to plate plastics. Some of the following are:

- Strike bath
- Acid copper bath
- Semi bright nickel bath
- Chromium plating bath

Solution Control

The process described above should be done in the best of conditions possible. You should rinse the PolyJet model being plated after every step taken. There should be careful watch over different aspects of each constituent. pH levels, temperature, or brightener level fluctuations may ruin the whole process. The Hull cell is one of the most vital tools in electroplating. It can show current ranges, the appearance of the deposit, and check if there are impurities. If there are any changes in the solution the Hull cell would know. Troubleshooting electroplating is a long and lengthy process. There are hundreds and hundreds of possible explanations for why your bath is bad. You should be able to know the most common troubleshooting tips if you were to start electroplating for industry.

Applications

Metal Plating is the method of applying a metallic coating to another material. There are many reasons to plate objects. They can be applied to almost any coarse material. Plating can be used for different reasons. Some models are plated to increase their sturdiness and provide a hard shell for whatever it is plate on. Some are plated to avoid corrosion, and a few are plated just to give off an attractive finish.

Figure 3. Metallizing the Objet moodel with a conductive surface

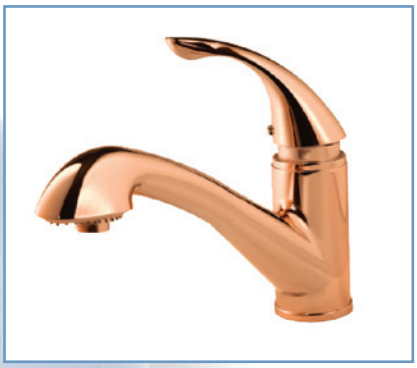

Figure 4. First coating of model with copper

Figure 5. Final metal coating by nickel

As described above, metal plating can be used for a number of reasons. Nickel plating is one of the most common used in decoration. When combined with an under layer of chromium, it provides a bright, shiny surface that is corrosion-free, and resistant to wear. These products can be found in car parts, metallic decorations (like streamers). Nickel Plating is used for the following reasons:

- Provides a bright, shiny appearance.
- It can conduct electricity
- It can plate a large variety of materials
- Has high resiliance to wear and tear
- Is corrosion-resistant
- Long lasting

Automotive, appliance, military, marine, trucking, electrical and construction are some of the markets in which metal coating is found. Metal coating can be applied to parts such as fasteners, brackets, clips, clamps, stampings, beams and rotors.

“As a technology leader, says Mr. Paul Willment, we are continually developing and experimenting with cutting-edge technologies and processes to meet the customers’ changing metal finishing needs of the industries we serve”. Morganic Metal Ltd continually improves its electroless nickel process for Objet models, our most popular coating process, to keep it at the forefront of the electroless plating marketplace.

Disclaimer

Objet Geometries Ltd. is not responsible for misuse of our products or their use in conjunction with unsafe or improperly maintained equipment or for uses other than intended as specified in this application note.

Information and pictures in this applications note are curtsey of Mr. Paul. S. Willment Director, Morganic Metal Ltd. www.morganicmetal.com

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