YAMATO

Beryllium Copper Trivia Pt. 1

For our 8th newsletter, we are introducing one of our leading manufacturing materials, beryllium copper. While sharing some trivia about beryllium copper alloys, we will also answer some questions that our customers have asked in the past about the material.

Do you happen to remember the periodic table that you studied during middle school and/or high school chemistry classes? Beryllium (Be) is 4th on the periodic table and is lighter than aluminum (Al), 13th on the table. However, by adding beryllium to copper, the alloy displays high-strength properties and excellent electrical and thermal conductivity.

Beryllium copper alloys are roughly classified into high-strength beryllium copper alloys (BeCu25, BeCu165) and high-conductivity beryllium copper alloys (BeCu50, etc.) according to the content of beryllium. High-strength beryllium copper alloy has the highest strength and hardness of all copper alloys. It is a material that has a strength comparable to special steel and excellent elasticity, electrical conductivity, and corrosion resistance by applying appropriate amounts of heat treatment. The main applications for high-strength beryllium copper alloys are for explosion-proof tools, resistance welding electrodes, housing parts for submarine cable relay bases, plastic ejection mold materials, bearing materials, connectors, and sockets for semiconductor inspection. BeCu50, a high-conductivity beryllium copper alloy, is a well-balanced material with an electrical conductivity of over 45% IACS and a tensile strength near 800 MPa. Its main applications are for resistance welding electrodes, bearing materials, plunger tips, casting molds, mold materials for plastics, and connectors.

Now, let’s move on to some questions asked by our customers.

✧ Question 1: Is Beryllium Copper 50 a Mill Hardened Material? What is a Mill Hardened Material?

A Mill Hardened Material means that, similar to the processing of coffee beans in mills, materials are processed in a mill and factory to increase hardness. Simply put, materials

are processed through rolling machines, then manufacturing machines, and then further processed at the factory. In the case of our Beryllium Copper 50 alloy, the material is put through a special age-hardening heat treatment process to achieve specific electrical conductivity and strength properties. So, it is a Mill Hardened Material.

✧ Question 2: What is the difference between Beryllium Copper 25 and 50?

The customer who asked this question had 10 sets of electrode parts, both Beryllium Copper 25 and 50, with exactly the same shape. The appearance of the electrodes had changed over time due to energization and became indistinguishable. Furthermore, the customer had no record to distinguish the parts and their original Beryllium Copper content.

The density of Beryllium Copper 25 is 8.3/cm^3, and that of Beryllium Copper 50 is 8.8-9.0g/cm^3. Beryllium Copper 50 is heaver when weighed, but the difference between the two alloys is negligible.

The simplest and most accurate method to distinguish the two alloys is to observe the difference in color. Apply a light acid (such as diluted toilet cleaner) to a cotton swab, rub the material for about 30 seconds, and then observe its color.

Beryllium Copper 25 has a gold coloring while Beryllium Copper 50 has a red coloring. This coloring is determined by how much beryllium is within each alloy. In fact, Beryllium Copper 50 is closer to pure copper because of its low beryllium content. Outside of Japan, high-strength copper alloys are called “Gold Alloys,” while high-conductivity copper alloys are called “Red Alloys.”

How did you like this newsletter? Next month, we will be discussing cleaning, welding, machining characteristics, magnetism, high and low temperature characteristics, fatigue, stress relaxation resistance, etc. of metal materials in part 2.

Thank you for reading and for your continued support.