International Association of Societies of Design Research Congress 2023
LIFE-CHANGING DESIGN
Politecnico di Milano
9-13 October 2023

Creating durable jewellery with the metal recovered from electronic waste from a technical perspective

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doi.org/10.21606/iasdr.2023.634

1 Introduction

It is estimated that the electrical equipment discarded in 2021 weighs more than 57 million tonnes. Less than one-fifth of this electronic waste (e-waste) is recycled. Printed Circuit Boards (PCBs) are an integral component of any electronic equipment, and this is a useful type of waste due to its high metal content of nearly 30%. This practice-based research aims to explore how to transform metals recovered from e-waste using a hydrometallurgy technique (that works with metals in solution) into wearable jewellery. This article focuses on a technical perspective, applying electroforming to a wide range of materials, organizing experiments intended to function as exemplars for further research and collaboration between design and science perspective.

2 Method

For this practice-based project, the experiments would be electroforming and design testing, below Figure 1 demonstrates how the experiments are connected to the four- stage model. During the reflective process, documentation is the main method of recording whose outcome will be analysed and summarised for further research steps. I recorded every step of my artistic process from conceptualising to manipulating the testing pieces and executing the artworks in multiple ways, including a written blog, sketchbook the experiment recording.

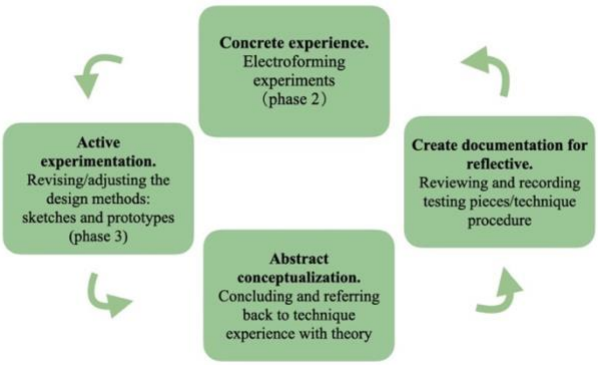

Figure 1. Four-stage reflective model.

3 Research summary

Electroforming has exhibited remarkable adaptability by accommodating an array of materials, including organic substances and stone-setting techniques. This evolution has ushered in a new era of innovation in jewellery design, as craftsmen now seamlessly fuse unconventional elements with intricate shapes and textures. In the realm of organic materials, such as leaves, petals, and wood, the challenge lies in conserving the delicate intricacies of their surfaces during the electroforming process. Electroforming's controlled deposition of metal ions onto a conductive substrate facilitates the gradual build-up of a metallic layer that faithfully mirrors the original texture.

Figure 2. A rose petal ring made from electroforming.

The integration of electroforming techniques into stone setting within the realm of jewellery fabrication represents a compelling convergence of traditional craftsmanship and contemporary innovation. Through a controlled electrochemical approach, artisans can tailor the thickness, texture, and shape of the metal setting, enabling the creation of unique designs that harmonize with the gemstone's aesthetics.

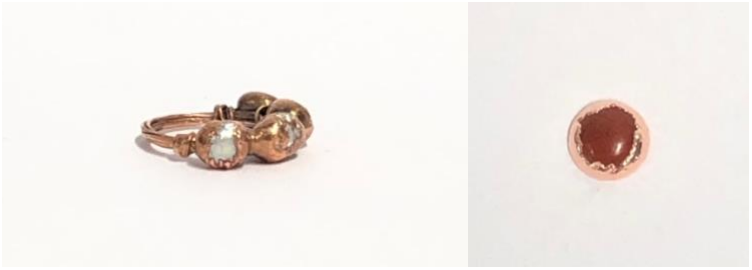

Figure 3. Electroforming is applied on different kinds of crystals.

Electroforming could also be used to transform the drawings into metalwork. The drawing is immersed in an electrolytic bath, and controlled electrical currents cause metal ions to deposit onto the graphite lines. Over time, a metallic layer builds up on the drawing, faithfully replicating the lines and textures of the original artwork. Currently, the drawings are on the plastic sheet, where the drawing imparts its texture and details onto the metal surface as the metal gradually builds up during the electroforming process.

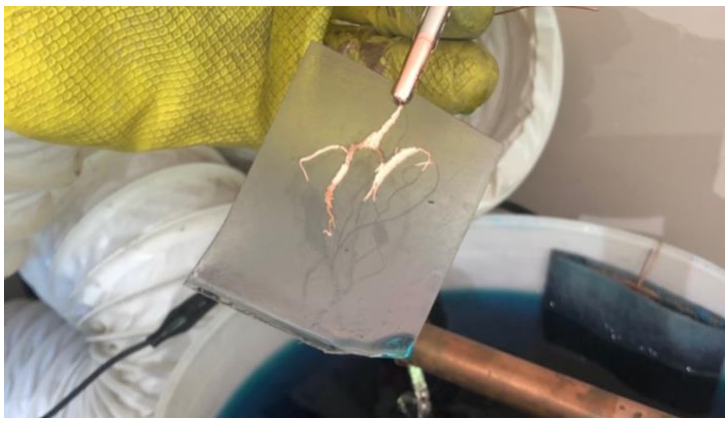

Figure 4. The drawing transformation works in progress.

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