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Harnessing the Fusion of Microwave-formed Glass Techniques for Crafting Exquisite Three-Dimensional custom-made jewellery

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Abstract: *The art of glass crafting has undergone a transformative journey over centuries, with artisans continually exploring novel techniques to push the boundaries of creativity. Microwave-formed glass techniques represent a recent advancement in the field, offering unparalleled speed, precision, and versatility in shaping glass into intricate three-dimensional forms. This study explores the application of microwave-formed glass techniques in contemporary craftwork, highlighting its potential to revolutionize traditional glass crafting practices. Through a combination of theoretical insights and practical examples, this study explored into the unique characteristics of microwave-formed glass and its implications for crafting exquisite three-dimensional custom jewellery.*

Keywords: *Kiln-formed glass, Three-dimensional pendants, Fusing, jewellery, Artistic synergy*

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I. Introduction

The convergence of art and science has long fuelled innovation in the sphere of craftwork, with advancements in technology continually shaping the creative landscape. One such innovation that has garnered significant attention in recent years is the use of microwave-formed glass techniques in crafting three-dimensional artworks. Unlike traditional glass-working methods that rely on heat sources such as furnaces, torches, or kilns, microwave-formed glass techniques harness the power of microwaves to rapidly heat and shape glass with unparalleled precision. (Sutton, 1989; 1993) opined that microwave energy can efficiently produce bulk glasses on a small scale, using significantly less energy and time compared to traditional glass melting methods. According to (Das et. al., 2009), microwaves of different frequencies and wavelengths are employed for a wide range of applications related to glass melts.

One of the key advantages of microwave-formed glass techniques is their ability to achieve precise control over temperature and heating gradients, allowing artisans to create intricate and finely detailed three-dimensional forms. Additionally, the rapid heating and cooling cycles associated with microwave-formed glass techniques enable artisans to work more quickly and efficiently, reducing production times and enhancing workflow flexibility. Moreover, microwave-formed glass techniques offer environmental benefits, as they typically require less energy and produce fewer emissions compared to traditional glass working methods. This study harnessed the microwave oven to fuse glass to form a three-dimensional custom-made jewellery.

II. EXPERIMENTAL PROCEDURE

1.1 materials and tools

The materials listed below were used to carry out this project:
1. 900W Electric Microwave Ovens
2. Varieties of opal, millefiori, Dichroic glasses and waste glasses
3. Microwave kiln pot
5. Ceramic fibre paper

Figure 1. Schematics of microwave glass formed jewellery process

1.2 Basic Glass Cutting: Lay the glass on a clean, flat surface. Mark off the cut with a marker, lay a straight edge over the glass and line it up with the marks just made. Hold the straight edge firmly and score the glass with a quality glass cutter. The straight edge is lined up with the score line just made. Then the glass was pressed down on the scored line and then the glass brakes.

Figure 2 Glass cutting

1.3 Layering: The first layer is called the "Base". The base glass is the bottom or back of the project. The second layer is the artistic design portion of this project.

Figure 3. Multi-layered coloured glassed ready to be fused.

1.4 Placing layered glass in the kiln: Ceramic fibre paper was placed in the microwave kiln, ensuring that none of the glass made contact with the kiln's bed or sides.

Figure 4: Layered glass ready for microwave fusion

1.5 Firing the glass: The workpiece is placed in the kiln and then carefully put into the microwave (1000 watt), with a fusing time set to 5 minutes. The speed of the process is influenced by the microwave's wattage and the oven's steady voltage, as well as the type of glass being used.

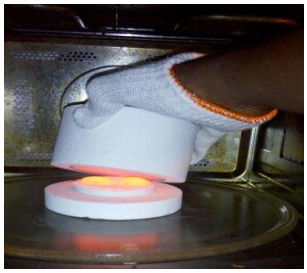

Figure 5: fused Microwave form

Figure 6. fully fused glass forms.

III. RESULT AND DISCUSSION

The result of the outlined processes undertaken in the Production of Microwave-Assisted Glass Fusing for the Production of customizable glass jewellery is ideally in line with innovative way of product development. These jewellery earrings and pendants exhibit consistent quality, diverse designs, and efficient mass production capabilities were undertaken. This development and process are relatively new in Nigeria. Therefore, the market testing phase is crucial for gaining insights into customer preferences, enabling iterative improvements and ensuring a successful and competitive presence in the glass jewellery market.

3.1. RESULTS

Figure 7. Earring: (Lightweight and elegant, in various styles, from studs to dangling pieces).

Figure 8. Necklaces and Pendants (Intricate designs with vibrant colours and unique shapes)

Figure 9. Necklaces and Pendants (Lightweight and elegant, in dangling pieces).

Figure 10. Displayed Necklaces and Pendants on a mannequin

3.2. DISSCUSION

The production of customizable glass jewellery earrings and pendants through microwave-assisted glass fusing has been a novel and promising avenue explored in this study. This discussion will explore into the key findings, implications, and potential applications of the study.

1. **Microwave-Assisted Glass Fusing Efficiency:** The study found that microwave-assisted glass fusing demonstrated a higher efficiency compared to conventional methods. The rapid and selective heating provided by microwaves allowed for quicker fusing of glass layers, reducing production time and energy consumption.

2. **Customization Potential:** One of the notable outcomes of this study is the heightened level of customization achievable through microwave-assisted glass fusing. The controlled heating process allowed for intricate designs and fine details in the glass earrings, enabling a diverse range of personalized options for consumers.

3. **Material Compatibility:** The study investigated the compatibility of various glass materials with microwave-assisted fusing. Results indicated that a wide range of glass types could be successfully fused using this method, opening up possibilities for experimentation with different colours, textures, and opacities.

4. **Strength and Durability:** Assessments on the strength and durability of the microwave-fused glass earrings revealed promising results. The bonds formed during the fusing process exhibited good structural integrity, suggesting that the earrings and pendants could withstand normal wear and tear.

3.3. IMPLICATIONS OF THE STUDY

1. **Market Potential:** The ability to produce customizable glass earrings efficiently and with a high degree of personalization has significant implications for the jewellery market. Consumers often seek unique and distinctive pieces, and this method offers artisans and designers a platform to meet these demands.

2. **Sustainability:** The faster production time and reduced energy consumption associated with microwave-assisted glass fusing align with growing concerns for sustainability in manufacturing. This method presents an environmentally friendly alternative to traditional glass fusing techniques.

3. **Artistic Expression:** Artists and jewellery designers can leverage the customization potential of microwave-assisted glass fusing to express their creativity in new and innovative ways. The technology opens avenues for the creation of wearable art that goes beyond conventional designs.

IV. CONCLUSION

This study underscores the potential of microwave-assisted glass fusing as a transformative method in the production of customizable fused glass jewellery earrings and pendants. Its integration of technology into traditional craftsmanship not only improves efficiency and sustainability but also offers a unique platform for artistic expression, promising exciting possibilities for the world of jewellery design

Conflict of interest

There is no conflict to disclose

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