

Designing 3D Mosaic Technique Using Glass and Resin with the Inspiration of 'Bandung Lautan Api'

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ABSTRACT

Mosaic is one of the oldest art forms in the world with a wide variety of techniques and variations. With so many mosaic techniques, this research focuses on the development of 3D mosaic techniques. After conducting research and experimentation, the author decided to use glass and resin in the product design.

The author drew inspiration from the historic Bandung Lautan Api because its values deeply resonate with the author's family experiences. Born and raised in Bandung until age four, the author had to abruptly leave everything behind and move to Jakarta due to personal issues. This event parallels the Bandung Lautan Api, where residents were forced to abandon, destroy their homes, and sacrificing themselves for the greater good. Through this project, the author aims to share these experiences and the values of resilience that many people who have had to leave their homes might relate to.

Keywords: Mosaic, Bandung Lautan Api, Glass Waste, Resin

INTRODUCTION

Mosaics are an art form that involves arranging small pieces of colored material, such as glass, stone, or ceramic, to create intricate images or patterns. These pieces, called tesserae, are carefully placed and affixed to a surface, typically using cement or adhesive. Each tessera retains its distinct identity within the final composition (Levy & Givens, 2011). Mosaics have been used decoratively for thousands of years across various cultures and historical periods. Artists select materials based on color, texture, and durability.

Contemporary artists continue to innovate in mosaic art by incorporating new materials and techniques, drawing from both traditional and modern sources. Mosaics are valued for their aesthetic appeal and cultural significance, allowing artists to express ideas and create unique, functional products. By researching materials and exploring 3-dimensional and transparent mosaic techniques, artists can develop innovative products with endless variations in type, finish,

and appearance. This project aims to preserve and commemorate Indonesian culture by bringing its history into the modern era through mosaic art. The research will culminate in a collection of household products themed "Bandung Lautan Api," showcasing Indonesian history in a contemporary context.

LITERATURE REVIEW

History of Bandung Lautan Api

Bandung Lautan Api was a major historical event that occurred in Bandung, West Java, Indonesia, on March 23 and 24, 1946, during the Indonesian National Revolution. After Japan's surrender in August 1945, Dutch and Allied forces arrived, raising suspicions of reoccupation. On February 16, 1946, the 23rd Indian Infantry Division moved to Bandung, leading to skirmishes in early March. On March 22, British authorities informed Indonesian Prime Minister Sutan Sjahrir of their plan to retake Bandung.

In response, approximately 200,000 Bandung residents burned their homes and evacuated to prevent the city from becoming a military base. The event, called "Bandung Lautan Api" due to the widespread fires, was a strategic move to maintain Indonesian independence. It is remembered as a key moment in the struggle for independence, symbolizing the people's determination to defend their freedom achieved on August 17, 1945. It taught us that everyone can fight back and get justice, even if it is in a painful way (Djajusman, 1975).

Tabel 1 History Timeline of Bandung Lautan Api Incident. (Source: Personal Data, 2023)

No.	Date	Description
1.	12 Oktober 1945	Allied forces arrived in Bandung to disarm Japanese soldiers and free Dutch European prisoners. The Dutch or NICA took advantage of this situation to piggyback on the Allied forces with the aim of controlling Indonesia again.
2.	21 November 1945	TRI (Indonesian People's Army) and other Indonesian fighters attacked British troops in North Bandung.
3.	24 November 1945	The Allies (Colonel McDonald) gave an ultimatum to vacate North Bandung.
4.	25 November 1945	The ultimatum was not heeded, there were battles in several areas of Bandung. British troops did not hesitate to drop bombs on several areas in Bandung.
5.	23 Maret 1946	Colonel McDonald issued a second ultimatum. South Bandung must be vacated.
6.	24 Maret 1946	Within 7 hours, the TRI (Indonesian People's Army) under the leadership of Colonel A.H. Nasution, Bandung was burned down.

Identification with IMO Method

The IMO (Inner, Middle, Outer) design research method is a comprehensive framework that categorizes three layers or levels of a system or experience to

thoroughly analyze and improve design. The Inner level focuses on the core elements and fundamental principles, such as stories, emotions, and cultural feature. The Middle layer deals with the operational and interactive aspects, including dealing with function, operational concerns, usability, and safety. The Outer layer encompasses physical aspects, dealing with color, texture, form, decoration, surface pattern, line quality, and detail. By examining these three layers, the IMO method provides a holistic understanding of the design, ensuring that all critical aspects are considered and aligned with overall goals and user needs. This layered approach helps identify and address issues at different levels, leading to more effective and sustainable design solutions.

History of Mosaic

The Mosaic, an ancient art form involving small pieces of colored glass, stone, or other materials, originated in Mesopotamia in the 3rd millennium BCE. Initially using clay cones in Babylon, the Greeks advanced the craft with intricate patterns and scenes using pebbles and tesserae. The Romans expanded its use to homes and public spaces, depicting mythology and daily life. Byzantine mosaics focused on religious themes with rich colors and gold leaf. In the 19th and 20th centuries, Antoni Gaudí revitalized mosaic art with his whimsical designs in Barcelona, notably in Casa Batlló and Park Güell, reflecting his innovative and nature-inspired architectural style.

Basic Mosaic

Mosaics have many variations, so the author must analyze the mosaic-making process in detail, from tools and materials to the stages of creation. Essential tools include a mosaic base, tesserae, tile nipper/cutter, adhesive, grout, sealant, spatula, and sponge. The basic mosaic process begins with designing, where designs are drawn on the mosaic base. Tesserae are then placed on the base using an adhesive suitable for each material. Once arranged and secure, grout is applied between the tesserae and cleaned with a sponge. For basic mosaics, sealants are rarely used as the grout itself is durable.

METHODOLOGY

The research uses the Research through Design (RtD) approach, involving iterative cycles of design, prototyping, and testing. This method allows for continuous refinement and evaluation of design concepts. The research includes a literature review on mosaic history, existing mosaic techniques, the history of Bandung Lautan Api, and the IMO method. The author also experiments with various mosaic techniques, from basic to transparent mosaics.

Additionally, studies, quality function development, and sketches are conducted before creating prototypes for the final collection. The research concludes with a summary and evaluation of the final product and a discussion on potential improvements for the future.

RESULT & DISCUSSION

Identification with IMO Method of Bandung Lautan Api

These 3 layers are identified by key design attributes, including attributes that reflect function, aesthetics, and symbols.

Tabel 2 IMO of Bandung Lautan Api. (Source: Personal Data, 2023)

OUTTER (physical)	MIDDLE (Functional)	INNER (Meaning)
Bandung city	Wanted to be used as an allied base	In weakness = people will take advantage
The people of Bandung	Fought in several areas of Bandung	Pride & happiness in defending homeland
Sea of Fire	Resistance in the form of burning Bandung	Anger and sadness = Love and happiness
Bandung Lautan Api Monument	Commemoration Bandung Lautan Api	Struggle = in any situation there is still resistance

Mosaic Experiment

Mosaic are an unlimited form of art, both in terms of base, material, and finishing. The author found that a lot of materials ranging from waste, as well as rocks and infinite materials can be made into mosaic artworks. Likewise, the media or base of the mosaic also has no limits, where mosaics can be made on 2D or 3D bases, such as on vases or even chairs and sculptures. Therefore, the author went into personal experimentation and tried various tools, base materials, tesserae/color materials, gap filling materials, and sealant/finishing materials.

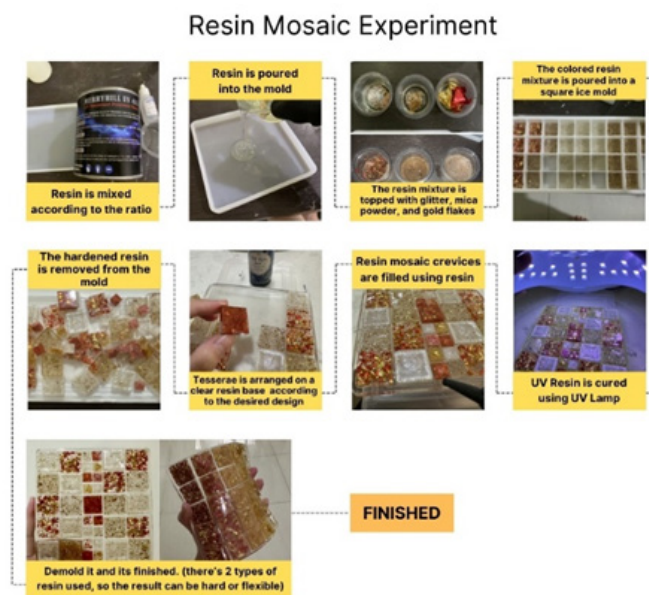


Image 1 Resin Mosaic Experiment. (Source: Personal Data, 2024)

This resin mosaic experiment uses three types of resin, PU resin, UV resin and flexible resin. Different types of resin produce different results of mosaic, where the texture, curing time, and finishes can be customized.

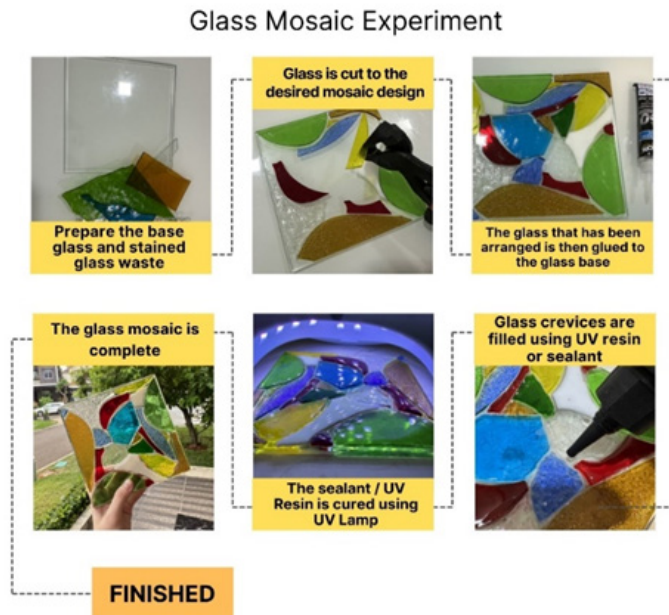


Image 2 Glass Mosaic Experiment. (Source: Personal Data, 2024)

Glass mosaic is super simple and straight forward to make. This mosaic uses glass base, stained glass waste tesserae, and resin as the sealant. Glass mosaic can achieve the look of stained glass but can be made without intricate tools or materials.

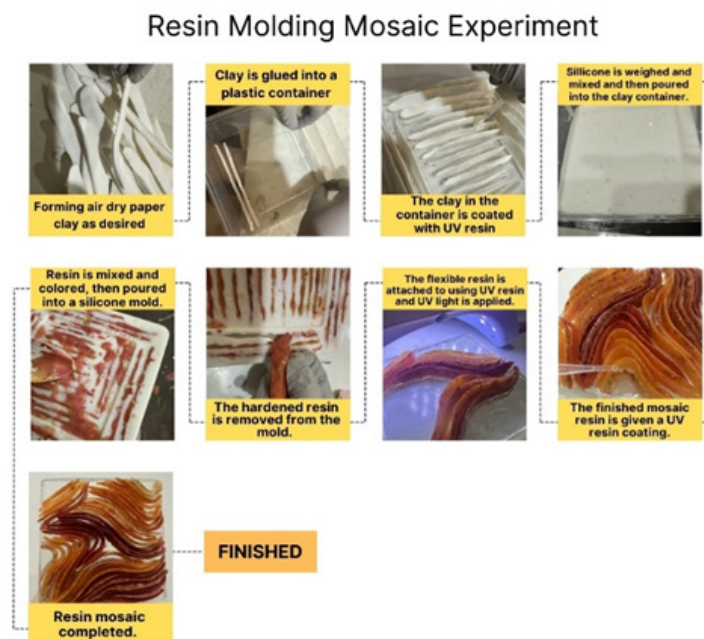


Image 3 Glass Mosaic Experiment. (Source: Personal Data, 2024)

Resin molding mosaic uses two type of resin, flexible resin and UV resin. This molding technique allows each tesserae to be customized by size, color, and shape. By using mold, variety of mosaic base are widened as well and it's possible to be used on 3D base.

Sketches and 3D Model



Image 4 Sketches of Ideation and Concept. (Source: Personal Data, 2024)



Image 5 3D Model of 'Bandung Lautan Api' Collection. (Source: Personal Data, 2024)

Final Prototyping Process

The following is a production process of the candle holder and vase collection inspired by Bandung Lautan Api.

Candle Holder Making Process

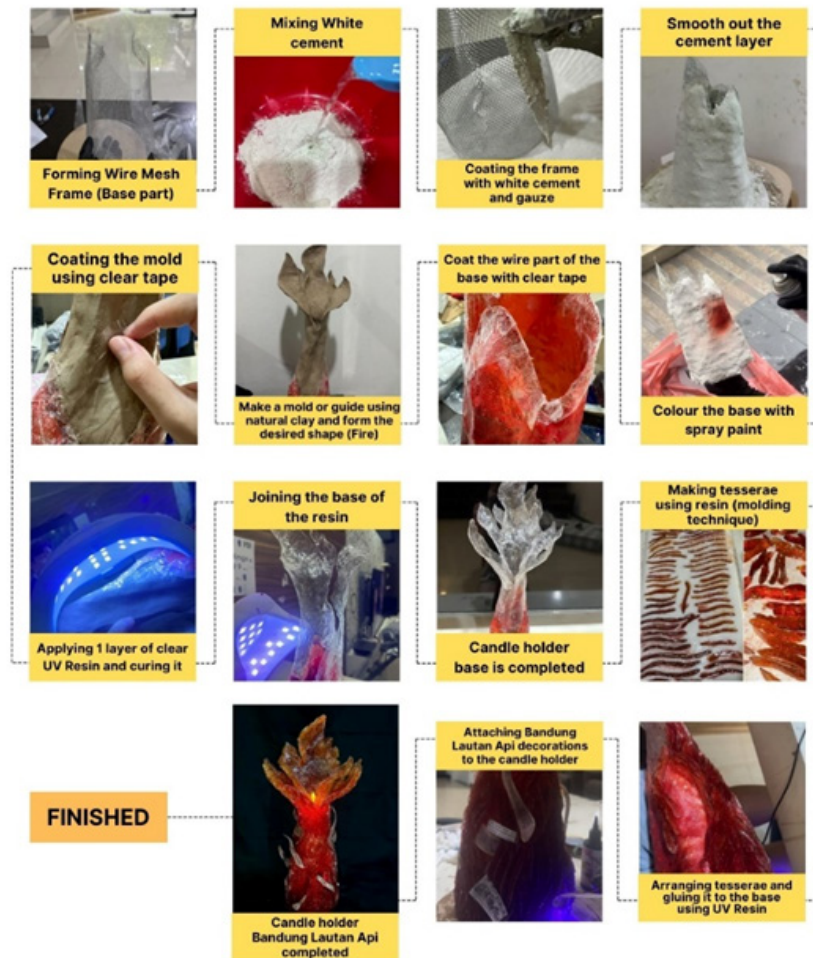


Image 6 Candle Holder Making Process. (Source: Personal Data, 2024)

This candle holder is made using a 3D wire and cement base and Clear UV resin is used to for the upper part of the base. On the other hand, resin tesserae is made using silicone mold with different shapes and sizes. Each tesserae is arranged and glued one by one so it resembles smoldering fire.

The author wanted to incorporate as much elements of 'bandung lautan api'. On this product, the author use real mail stamps of bandung lautan api 1946, not only that, photos, news and words from a real newspaper is used. All the decorations are coated with UV Resin and glued to the Candle Holder. This candle holder is also decorated with floating words and messages from the author as a commemoration of Bandung Lautan Api incident. Lastly, this candle hoder uses flickering LED Candle as the main source of light.

Vase Making Process



Image 7 Vase Making Process. (Source: Personal Data, 2024)

This Human Body Vase is made using stained glass waste. It is arranged and glued using UV resin and cured using a UV lamp. Once the shape is as desired, the glass is coated with one last layer of resin to make it glossy and smooth.

Final 'Bandung Lautan Api' Collection



Image 8 Final Candle holder and Vases with Details. (Source: Personal Data, 2024)



Image 9 'Bandung Lautan Api' Collection. (Source: Personal Data, 2024)



Image 10 'Bandung Lautan Api' Collection. (Source: Personal Data, 2024)

Discussion

	Traditional	Contemporary	Meaning
Symbolic Element	'Bandung Lautan Api' Monument 	Smoldering Fire Shape 	Modernize the shape of the Bandung Lautan Api monument. It symbolizes the sea of fire and the resistance of the people of Bandung
	The people of Bandung 	Human form raising one hand 	The vase symbolizes the Bandung warriors who are raising their hands to fight bravely, despite feeling deep sadness and anger

Image 11 Symbolic Element of 'Bandung Lautan Api' Collection. (Source: Personal Data, 2024)

The vase is designed to resemble a human shape, divided in the middle. One side represents the sadness of the people of Bandung, who had to destroy their own homes, while the other side symbolizes their pride in preventing their homeland from becoming invader headquarters. Made from transparent glass waste, the vase reflects light, symbolizing pride and hope.

The candle holder represents the Bandung Lautan Api Monument, resembling a smoldering fire to symbolize grief, struggle, and pride. The candle represents the spirit and sorrow of Bandung's people. It is made with a cement and wire base, combined with resin on top. The mosaic, made of resin, resembles fire.

CONCLUSION

Indonesian history is becoming less interesting to the younger generation due to limited access to historical products integrated into daily life. To address this, creating modern decorative artwork that appeals to young people is suggested. The Bandung Lautan Api collection aims to make history more engaging by producing functional and aesthetically pleasing items that reflect Indonesian history.

One colored glass industry in Indonesia, the stained glass factory, faces high costs and waste issues. Reusing stained glass waste can reduce costs and waste accumulation. Since Indonesia cannot produce colored glass and must import it, utilizing waste glass for products like vases can optimize material use and minimize environmental impact.

The research explores mosaic techniques, including experiments with new materials and 3D mosaics, using glass waste as tesserae. While the collection uses some waste materials and conveys a historical message, it mainly includes functional, aesthetically focused products. The mosaic techniques offer versatile applications but target a limited market due to their non-essential nature and fragility.

The study primarily focuses on mosaic techniques for artistic products, potentially neglecting other aspects of mosaics. Future research could examine the environmental impact of using waste materials more comprehensively, aiming for fully sustainable collections without resin. Investigating market potential and consumer preferences, as well as exploring innovative materials and techniques, could expand the appeal and reduce shipping risks of fragile items.

REFERENCES

- Akinmade, L. (2015). Meet the coolest mosaic artist in Ravenna, Italy - lola akinmade. Lola Akinmade - Experiencing culture through food, tradition, and lifestyles... <https://www.lolaakinmade.com/europe/meet-the-coolest-mosaic-artist-in-ravenna-italy/>
- Bedirian, R. (2020). A look at the mosaics inside the Hagia Sophia: They tell a layered and important history. The National. <https://www.thenationalnews.com/arts-culture/art/a-look-at-the-mosaics-inside-the-hagia-sophia-they-tell-a-layered-and-important-history-1.1050244>

- Belosh, M. (2022). Best contemporary mosaic artists you need to meet - mosaics lab - contemporary mosaic art, Custom Mosaic artwork, & mosaic tiles. https://www.mosaicslab.com/blog/best_contemporary_mosaic_artists/
- Djajusman (1975). Bandung lautan api: suatu episode dari perjuangan kemerdekaan. Indonesia: Angkasa.
- Foster, J. (2013). Peachpit. <https://www.peachpit.com/articles/article.aspx?p=2162084&seqNum=2>
- Levy, I., Givens, P. (2011). Mosaic Fine Art Abstracts. (n.p.): Lulu Press, Incorporated. w.
- Sadurski, W. (n.d.). Antoni Gaudi, Casa Batlló, Barcelona. WiS Arts of Vision, Light and Creation Artwork. <https://wisarts.com/photo-gaudi-casa-batllo.html>
- Saraceni, J. E. (n.d.). Pebble Mosaic unearthed in Western Greece. Archaeology Magazine. <https://www.archaeology.org/news/6888-180810-greece-pebble-mosaic>
- Sistem Informasi pengelolaan sampah Nasional. SIPSN. (n.d.). <https://sipsn.menlhk.go.id/sipsn/>
- Sofyan. (n.d.). Sejarah Bandung lautan api: Peristiwa, Tokoh, Dan 10 Titik Stilasi. Gramedia Literasi. <https://www.gramedia.com/literasi/bandung-lautan-api/>
- Wolfson, J. (1992). The Magical Effects of Color. Amerika Serikat: C & T P