Waste to Wealth: Converting Plastic Waste for Sculptural Production

By

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Abstract
Plastic wastes are by-product for human consumption which constitutes challenging issues faced by virtually all urban and city centres around the world today. The objective of this paper is to produce sculptures that will draw visual characters from recycled plastic waste that are littered all around our environments. The melting of plastic for casting in relief sculpture appears to have hitherto been explored. Yet no proper documentation of procedure and experimentation of melted plastic waste for sculpture hence literature on this direction is paltry. This is the problem this paper is out to solve. The objectives of the paper are to produce sculptures that would draw visual character from melted plastic wastes, recycle plastic waste into molten material through melting for sculpture cast adopt and design refactory molds for plastic casting of relief sculpture; explore and experiment with plastic waste in order to determine its suitability as an alternative to conventional casting of sculpture.

Introduction
Virtually every day, people drift from the rural communities to the urban and city-centres in the quests for better living conditions and improved lifestyles. This unchecked and uncountable influx of people (men, women and children) contribute immensely to the population explosion in the cities and urban centres which adversely affect the general demands for food items and other consumables. According to Salau and Ore (2016) the use of
nylon appear to have come to stay in Nigeria, as most people prefer it other product when it comes to wrapping sundry items. Hence from the roadside food sellers who often sell to customers in nylon bags to the baker that sells pastries, confectionaries and bread, nylon usage is on the increase.

Again, plastic chairs have replaced the conventional pews. In every social event and public gatherings, plastic chairs and tables are the commonest and popular seat used. Down in our homes, plastic products have replaced most traditional products, such as traditional drinking pot, which is now plastic bucket or big bowl. Several other products have also been replaced by plastic wares. But the big question is? When all these plastic products in their various designs are torn, worn out and no longer needed, how are they being disposed? Unfortunately these discarded plastic waste products are being littered in our streets, gutters, drainages and waterways as show below in plate I and V.

**Historical Background of Plastics**

According to Malom (1999) Modern plastic encyclopedia handbook (1994:22), the word “plastic”, is derived from the Greek (plastiko), which means “capable of being shaped or molded”, from plasto which means “molded”. The malleability or plasticity during manufacturing allows them to be cast, pressed or extruded into so many different shapes such as films, fibres, tubes, bottles, etc.

Backeland (1909) introduced phenoformaldehyde plastics, the first plastics or phenolics as popularly known, was the first plastics to achieve worldwide acceptance. He also evolved techniques for controlling and modifying the phenol formaldehyde reaction so that, products could be formed under heat and pressure from the materials.

Wikipedia, free Encyclopedia also revealed that plastic materials trace their origin to the United States at about 1868 when a young printer named John
Wesley Hyatt came up with celluloid, the first American plastic. He mixed pyroxylin with nitric Acid and camphor to create a new product the first motion picture film in 1882.

![Fig 1: A dump site of plastic wastes](image)

**Table 1: Historical background of plastic displayed in chronological order**

<table>
<thead>
<tr>
<th>S/n</th>
<th>Year of discovery</th>
<th>Types of plastic</th>
<th>Inventors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1908</td>
<td>Cellophane</td>
<td>Jaques and Brandenberger</td>
</tr>
<tr>
<td>2.</td>
<td>1909</td>
<td>First true plastic phenol formaldehyde</td>
<td>Bakehte Leo. H. Backeland</td>
</tr>
<tr>
<td>3.</td>
<td>1926</td>
<td>Vinyl or PVC a plasticized PVC</td>
<td>Walter Sermon</td>
</tr>
<tr>
<td>4.</td>
<td>1927</td>
<td>Cellulose Acetate</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>1993</td>
<td>Polyvinylidene chloride PVDC</td>
<td>Ralph Wiley</td>
</tr>
</tbody>
</table>
6. 1935  Low density polyethylene  Reginald Gibson
   LDPE

7. 1936  Acrylic or Polymethyl Methacrylate

8. 1937  Polyurethane  Otto Bayer

9. 1938  Polystyrene PTFE  Roy Plunkett

10. 1939  Nylon and Neoprene—a replacement for silk & a synthetic rubber  Wallace Hume Carother

Source: Alter (1993), Solid Waste: Policy option for plastic waste management research II, 319-322

According to Walter (2003), plastics are both natural and synthetic high polymer substance include rubbers which is capable of flowing under heat or pressure to a desired final shape. In agreement, Anderson (2014) sees plastic as, polymer with one or more additives with other reinforcing agents such as; plasticizer, pigments, dyes and retardant.

**Types of plastic**
There are basically two types of plastics, they are thermoplastic and thermosetting.

**Thermoplastics:** Langsner (2010) defines thermoplastic as plastics which become soft when exposed to sufficient heat and hardened when cool. This process may be repeated or continued despite the number of times. Whenever it is heated, it expands and becomes soft and when allowed to cool it hardens.

**Thermosetting:** They are hardened by curing and cannot be re-melted for further use, and they are difficult to recycle. Re-heating does not soften these plastics, sometimes they are grinded into powder and used as filler materials, Hull (2002). Thermoset is the direct opposite of thermoplastic.
Thermoset are referred to as non-recyclable plastic because they are said to have undergone chemical reaction leading to an infusible state hence they cannot be recycled and re-used, according to Bhatnagar (2004). All the plastic waste materials and equipments shown in Plate III are made of thermosetting materials.

**Recycling**

Plastic recycling is the result of the process of recovering waste plastic and reprocessing them into another useful product. Example, discarded empty bottle of plastic drinks and other containers are often recycled into fibre for the manufacturing carpets.

The studio process of Sculpture Production is achieved through the following phases:

i. Collection and selecting of waste plastic materials according to colours and chemical properties.

ii. Cleaning/washing and drying, then reducing the plastic wastes to a manageable size (chips or flakes).

iii. Melting the plastic waste materials to a molten state, scooping and pouring into the mould for press-cast to register and form the sculpture.

**Processing of Recyclable Plastics**

Processing of recyclable plastics is necessary so as to transform the collected materials into raw materials for the new product. This can be done through physical recycling which involves changing the size and shape of the material removing contaminants, blending in addition if it is desirable to change the appearance of the recycled materials.
Waste plastics recycling process at a glance

Collection

Washing/cleaning

Sorting according to their chemical properties

Size reduction into flakes chip and pellets

Heating to melt into molten or plastic state

Pour into a mould for registration

Allow to cool to form sculpture

Figure 2: Waste plastic recycling process at a glance
Materials / Tools and methods
The following materials, tools and equipment were used during the execution of the practical processes:

1. Plastic wastes (thermoplastic waste only)
2. Clay
3. Cement
4. Lubricating oil
5. Crucible pot, others include; gas burner, cylinder, safety gadget; nose and mouth guard, booths and hand gloves and coverall.

Materials Collection/Studio Analysis
Materials here entail conglomerate of various plastic wastes, accessories and methods of application that was brought to bear through pictorial and textual analysis. This involves the discussion and interpretation of the techniques involved in the production. All the tools mentioned earlier which enhanced the creative manipulation of the various materials used were put together to achieve the final production.

Discussion
This study explored the possibilities of melting waste plastics for production of sculptures. The experiment has recorded a huge success having overcome most of the challenges were identifying the easiest method of melting plastic wastes without britling. This was achieved by using an open fire with aluminum pot to melt the plastic to a molten state, then poured into the mould and press-cast for easy registration and setting without warping.

Summary & Conclusion
The finding reveals that melted plastic wastes can be used and recycled as an alternative way of production of sculpture without using fibre glass chemicals.
Contribution to Knowledge
This paper has opened a new opportunity for the upcoming sculptors on the potentials of producing new and virile approach to casting sculpture.

Plate XXVIII: Artist: Tito, Nato Gbeneakor
Title: Meditative Mary
Medium: Melted Plastic Waste
Size: 45cm x 60cm
Year: 2013

Relief Sculpture piece produced from waste plastic
Recommendation
Based on the experiment and the results of this study, the researcher recommends that;

1. Artist should take advantage of the availability of materials and explore to further experiment with waste plastics and other related materials for creativity.
2. Waste plastics should be encouraged in the list of materials for sculpture.
3. Plastic sculpture should be encouraged and introduced in our schools.
4. All the safety precautions identified in the course of this study must be strictly adhered to for efficient production of sculpture during the aforementioned materials.

References