

ENTREPRENEURIAL OPPORTUNITIES FROM RYCYCLING OF WASTE PLASTICS MATERIAL: A PANACEA FOR CHEMISTRY GRADUTES

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ABSTRACT

Entrepreneurship involves identification and creation of a previously unexploited opportunities followed by will and initiative to seize these opportunities. The classical model of entrepreneurship involves creation of new venture, but modern entrepreneurial approaches are also an integral part of establishing corporate academics and government organizations. Polymer materials can be found everywhere nowadays, such as plastic water and beverages bottles, the silicon rubber tips on your phone, the nylon and polyesters in your jacket or sneakers, plastic hospital and domestic waste among others are all polymers. This paper tends to review the entrepreneurial opportunity from recycling of these waste plastic materials. The plastics materials can be recycled and reuse as packaging materials ranging for local soft drinks makers such as Sobo and ginger. Similarly different source of energy can be generated from these waste plastics ranging from solid briquettes, liquid fuels as well as combustible gaseous fuels. Therefore, these techniques such as recycling, reuse and energy generation from these waste materials can provide many entrepreneurial opportunities to teaming chemistry graduates as well as wealth creation, thus improving revenue generation to the nation entirely. Polymer recycling technique is also an amiable in reducing

environmental problems caused by these polymeric waste accumulations on daily basis. It will also help in conserving our natural resources being from petrochemicals.

Keywords: *Waste, Polymer materials, Entrepreneurial, Fuels*

INTRODUCTION

During last decades, the great population increase world wide together with the need of people to adopt improved conditions of living led to dramatically increase of the consumption of polymers (mainly plastics) materials appear interwoven with our consuming society where it would be hard to imaging a modern society today without plastics which have a myriad of uses. In the field as diverse house hold appliances, packaging containers, medicine, electronics and automotive as well as aerospace components. A continued increase in the use of plastics ending up in the waste stream, which motivated to more interest in the plastics recycling and reusing (Hamad *et al*,2013). Entrepreneurship is based on the identification or creation of previously unexploited opportunity followed by the will and initiative to seize these opportunities (Washburn,2012). The classic model of entrepreneurship involves new venture creation, but entrepreneurial approaches are also an integral part of established corporate academic and government organization (Bhide, 2000 and Trimmonn,2008) . Entrepreneurship is the capacity and willing to develop, organize and manage a business venture along with any of its risk in order to make a profit (Mobolaji,2017). An entrepreneur is a person who organizes and manage any enterprises, especially a business, usually with considerable initiative risk. According to Onyeku *et al*(2015) entrepreneurship involves a process of creating something new with value through innovation with associated financial rewards.

Polymers are large molecules made by binding (chemically linking) a series of building block (monomers) (Wikipedia,2018)

The word plastics are derived from the Greek "Plastikos" meaning capable of being shaped or molded. Plastics that are made up of polymers having only aliphatic (linear) carbon atoms in their backbone chain eg. Poly propylene; plastic that are made up of hetero chain polymer contains O, N,S in their backbone chain, in addition to carbon backbone eg. Polycarbonate. Plastics most thermosetting are amorphous while thermoplastics may be amorphous or semi crystalline (Pavani and Raja Rajeswari,2014). Plastic are a range of synthetics or semi synthetic polymerization products that can be molded into a permanent object having the property of plasticity. Plastics having a variety of properties are available at present have low specific gravity ease of fabrication, resistant to low thermal and electrical conductivities , many plastics can take range of colour to enable for decorative purposes. Plastics are widely used in making electrical instruments, automobiles parts, lampsgoogle,optical instrument ,house hold appliances e.t.c.

Classification of Plastics

Polymeric materials can be classified as thermosets and thermoplastics. Thermoset polymers refer to the irreversible polymerization and this type of polymer is cured by chemical reaction or heat becomes infusible and insoluble materials thermosetting plastics have three-dimensional cross-linked networked structures in which the polymeric chains are held by cross-links (strong covalent bond).These plastics do not soften on heating and they are hard, strong and more brittle . Thermosetting plastics cannot be remolded and hence cannot be

reused. Example of thermosetting plastics are phenolic resins (bakelite), polyester (terylene) etc.. Thermoplastics are made up of linear chains and this polymer soften on heating and harden when cooled (Amin and Amin,2011; Ribeiro *et al.*,2016; Ashori,2008, Pascault *et al.*,2002; Brazel and Rosen,2012 and Yang *et al.*,2012).

Thermoplastics polymers are represented by a large range of plastics materials. There are three types of thermoplastics polymers:

1. Crystalline thermoplastics, usually translucent with molecular chains which present a regular arrangement. Compared to other types, these polymers have more mechanical impact resistance. Examples of this types of polymer are Polypropylene (PP), low-density polyethylene (LDPE), and high-density polyethylene (HDPE).
2. Amorphous thermoplastics, usually transparent with the molecules arranged randomly. Examples of this type of polymers are polyvinyl chloride (PVC), polymethylmethacrylate (PMMA), Polycarbonate (PC), polystyrene (PS) and acrylonitrilebutadien styrene (ABS).
3. Semi-crystalline polymers combine properties of crystalline and amorphous polymers. The representative polymers for this group are polyesters, polybutylene terephthalate (PBT) and polyamide imide (PAI) (Amin and Amin,2011; Scholesser *et al.*,2003 and Nicholson,2017).

Impacts of Plastics Waste on the Environment

Plastics pollution is the accumulation of plastic product in the environment that adversely affects wild life, wildlife habitat and humans (Laura,2018). Plastics that act as pollutant are categories into

micro, meso and macro debris base on size (Harmmer *et al*,2012). Microdebris are plastics pieces between 2mm and 5mm in size (Barnes *et al*,2009).plastics debris that start off as meso or macrodebris can be come microdebris through degradation and collisions that break it down into smaller pieces (Hammer *et al*,2012). Microdebris is more commonly refer to as nurdles. Nurdles are recycled to make new plastics items but they easily end up released into the environment during production because of their small size. They often endup in ocean water through rivers and streams (Harmer *et al*,2012). Microdebris that come from cleaning cosmetic products are also refer to as scrubber due to the fact that they are small in size, filter-feeding organism often PCB's which are hydrophobic in nature and can cause adverse health effect. Plastics themselves contribute 10%ibute to approximately 10% of discarded waste. Many kind of plastics exist depending on their precursors and the method for their polymerization depending on the chemical composition, plastics and resins have varying properties related to contaminant absorption and adsorption. Polymer degradation takes much longer as a result of saline environment and the cooling effect of the sea. This factors contribute to the persistence of plastics debris in certain environments (Barnes *et al*,2009). It was estimated that global production of plastics is approximately 250mt/yr. their abundance has been found to transport persistent organic pollutants also known as POP's. These pollutant have been linked to an increase distribution of algae associated with red tide (Barnes,2009). The redistribution of plastics debris is highly variable as a result of certain factor such as wind and ocean current, coastline geography, urban area and trade routes

Human popular in certain areas also plays a large role in this. Plastic are more likely to be found in enclosed regions such as Caribbean. It serves as a means of distribution of organism to remote coast that are not their native environment. Plastics can be also used as vector for chemical contaminants such as POP'S and heavy metals (Barnes *et al*,2009). Chlorinated plastic can release harmful chemicals into surroundings soil, which can then seep into the ground water or other surrounding water source and also to the eco-system (Wikipedia,2018). This can cause serious harm to the species that drink the water.

Environmental impacts are wide ranging and can be both direct and indirect. Direct occur when marine life is physically harmed by marine debris through ingestion entanglement e.g a turtle mistake a plastic bag for food or a marine debris physically alters a sensitive eco-system. Also indirect such as when marine debris cleanup result in ecological change (Pavani and Raja,2014).

Accumulation of plastic bag and water bottles waste cause environmental pollution that can be manifested in number of ways such as deterioration of the natural beauty of the environment (Andrady,2003). Death and entanglement of marine animal (Hoffmeyr *et al*,2006 and Lithener *et al*,2009). Blockages of sewage system of cities and town in developing countries (Adane and Muleta,2011) which in turn create foul smells and favorable habitat for mosquitoes and other vectors that could spread diseases like malaria, cholera, among other (Ellis *et al*,2005), reduce percolation of water and proper aeration of agricultural soil which in turn result in a reduction of productivities of such field(Njeru,2006). The main solution to the

aforementioned plastics (polymer) pollution is the entrepreneurship/business education through recycling and reused of waste polymer materials.

What is Polymer entrepreneurship?

Polymer entrepreneurship involves the process of converting waste polymeric materials into marketable product for commercial use.

Why do we need Polymer Entrepreneurship?

There are numerous reasons why we need polymer entrepreneurship these include:

1. **To reduce poverty:** poverty can be reduced as a result of polymer entrepreneurship there by providing the means for entrepreneur.
2. **To create job:** as you all know we have number of thousand of graduates seeking for job, government and private sector cannot provides enough employment opportunities, but with help of polymer entrepreneurship(recycling and reused of waste plastics materials) a lot of job can be created.
3. **Economic growth:** polymer entrepreneurship help to increase the economic growth of the country, thereby providing a tax revenue to the government.
4. **It reduced crime:** as we all know, a lot of crimes arises as a result of unemployment. Therefore, with the helps of polymer entrepreneurship crime will be reduced to a certain limit due to the create of job/employment opportunities.
5. **Create of wealth:** As a result of buying and selling of waste plastic materials (polymeric material) via re-used or recycling, wealth can be created.

Entrepreneurial Opportunities from Waste Plastic Materials Recycling

There are numerous plastics materials that can be reuse and recycle. This include package of table water and beverage which can be reuse by making as a containing of packaging locally prepared beverages such as Sobo drink, “Kunun Aya” (tiger nut juice), ginger drinks,etc. on the other hand, they can be also recycle to produce many important products such as solid briquettes, other plastics products etc

Briquetting Process

Generally, the briquettes are made through the following procedures:

1. Raw materials preparation: mechanical fragmentation of raw materials by a crushing machines(which is up to the quality and size of the materials and the technology applied, and the procedure can be staged).
2. Drying of the crushed materials when the moisture content is too high for briquettes production.
3. Briquette the processed materials by using various types of briquetting machines such as the screw pressing machines, stamping pressing machines and hydraulic briquetting machines). The briquettes are made in the process of pressure agglomeration, in which the loose materials is molded into a permanent , geometrical and defined dimensions by the compaction pressure and intermolecular forces and bonds when necessary.

Briquetting densification technologies

Briquetting is one of the densification technologies for converting biomass wastes into solid and convenient fuel. Briquetting technologies can be classified in the following categories based on the mechanical

features and equipment involved: piston press densification, screw press densification, roll press densification and manual presses.

Benefits of converting wastes plastic material into fuel briquettes

1. Using fuel briquettes means to chop less firewood and less charcoal to buy, saving time and money and do contributions to ease the environment pressures.
2. You will get free fuel for cook if you make your own briquettes!
3. Make money by selling your briquettes!
4. To make briquettes from daily wastes means the rubbish on the streets and dumps will be reduced.
5. Briquettes have a durable quality, high burning efficiency and convenient to be stored and transported.

Process of Recycling Waste Plastic Materials

The following is a step by step process of plastics recycling:

1. **Collection:** plastics are available in a number of form, for example plastics container, jars bottle plastics bags, packaging plastics, big industrial plastic etc. due to their nature and availability, there are plastics collection centre and some business people have venture into plastic collection business (polymer entrepreneurship) as a source of income. Ton and tons of scrap plastics are collected and sent to collecting yard where they are then packed and transport to the plastic processing plant. Plastics can be collected from municipal waste being, household waste, offices, hospitals among other.
2. **Sorting:** the actual plastics recycling process start with sorting of different plastics items by their resin content and color. This process is also one to ensure all contaminants are eliminated.

There are specially designed machine that help in sorting the plastics according to their resin content. Then the recycling mill sort the scrap plastics by symbol at the bottom of the plastics.

3. **Shredding**: after sorting the plastics, the next steps is to cut the plastics into tiny chunks or piece the plastics bottle and containers are then ground and cut into tiny pieces of flakes. The heavier and lighter plastic flakes are separated using a specially designed machine. The separation process helps in ensuring that the different plastics are not put together or mixed up in the final product.
4. **Cleaning**: after a complete separation, the flakes or chunks are then washed with detergent to remove the remaining contaminants. Once the cleaning process is completed, the clear flakes are passed through a specialized equipment that further separate the plastics resins type. The plastic flakes are then subjected to moderate heat and dry.
5. **Melting**: the dry flakes are melted down. They can be melted down and molded into a new shape or they are melted down and process into granules. The melting process is done under regulated temperatures. There is a special equipment design to meltdown plastic without destroying them.
6. **Making of pellets**: after the melting process, the plastics pieces are then compressed into tiny pellet known as nurdles. In this state, the plastics pellets are ready for reuse or be redesigned into new plastic product.
- 7.

Common Recycled Plastics

The following are recyclable plastics:

1. Polyethylene Terephthalate (PET): this type of recycled plastic is tough, has excellent clarity, is strong and has a barrier to moisture and gas. It is used in the manufacture of water, soft drink, peanut butter and salad dressing bottles and jars.
2. High density polyethylene (HDPE): this recycled plastic is known for its excellent stiffness, resistance to moisture, strength, versatility, toughness and reduced permeability to gas, it is used in the manufacture of water, juice and milk bottles. It is also used to make retail and trash bags for household and business people.
3. Polyvinyl chloride (PVC): polyvinyl chloride has a number of applications. It is versatile, can be bent easily. It is tough and strong. This recycled plastic is commonly used in the manufacture of juice bottles, PVC pipes and cling films.
4. Low density polyethylene (LDPE): this is the most common type of recycled plastic. It has exceptional ease of processing; it is strong, flexible, tough and resistant to moisture and is easy to seal. This plastic is usually used in making frozen food bags, flexible container lids, freezable bottles etc. (Pavani and Rajarajeswari, 2014)

Advantage of Polymer Recycling

Plastics should be recycled because of a number of reasons as can be seen below:

1. Provision of a sustainable source of raw materials: Recycling plastic waste provides a sustainable source of raw materials to the manufacturing industry. Once the plastics are recycled, they are sent to manufacturing industries to be redesigned and converted into new shapes and used in different appliances.

2. Reduces environmental problems: since plastics are non-biodegradable, they pose a high risk to the people and the environment as a whole. They can block sewer line, drainages and other waterways leading to blockages and unwanted pileups. When plastics are eliminated through recycling, the environment looks clean and inhabitable.
3. Reduces landfill problems: recycling plastics minimize the amount of plastic being taken to the ever diminishing landfill sites. Most countries have designated area specifically meant for burying plastics. When they are recycled, these sites will receive little plastic garbage. The remaining areas can be used for other purpose instead of dumping plastics that do not decompose. These areas can be use for agriculture or human settlement. It should be understood that human population is growing each day and land is becoming a problem. Instead of misusing the land for garbage disposal it can be used for settlement and other important economic activities.
4. Consumes less energy: recycling of materials including plastics requires less energy as compared to making the plastics from scratch. This saves energy and that energy can be diverted to other important things in the economy. It is therefore important to encourage plastics recycling in the manufacturing industry as it will save the economy billions of money. The process of manufacturing plastics using natural raw materials is expensive and time consuming compared to the recycling process.
5. Encourages a sustainable lifestyle among people: individuals who have venture into plastic collection and recycling business will experience improved lifestyle as they get their daily income from polymer entrepreneur. This will in the long run improve

the economy and boost the living standard of the people. So donot just sit there doing nothing, embrace plastic recycling activities and improve the economic standard.

CONCLUSION

Plastic pollution is currently one of the biggest environmental concerns. With the help of polymer entrepreneurship this problems can be tackle, employment opportunity can be provide to both graduate in chemistry and also reduces environmental problems like pollution and landfit. A lot of disease such as malaria and cholera can be reduced. Economic can be rised as a result of polymer entrepreneurship. Briquette can be used as a source of energy for cooking without any harm to the human being.

RECOMMENDATION

1. People should be encourage on the need for polymer entrepreneurship.
2. Government and stake holder in every state and federation should provide a lot of machineries for recycling process of waste plastics.
3. There is a need for creating an alternative ways for recycling thermosetting plastics

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