An Overview of Approaches Used for Degradation of Synthetic Plastic Polymers

VIJAYA S. SANGAWAR[1] AND SEEMA S. DESHMEUKH[2]

[1]Department of Physics, Polymer Research Laboratory,
Govt. Vidharbha Institute of Science and Humanities, Amravati
[2]Department of Physics, Prof. Ram Meghe Institute of Technology & Research, Badnera
Corresponding author: ssdeshmukh.2009@rediffmail.com

Abstract

Most of the synthetic polymers are petrochemical based and are not biodegradable. the persistent of these synthetic polymers nowadays are major source of an environmental pollution. These indirectly affect the preservation of ecological systems and also harming wildlife when they are dispersed in nature. For example, the effects of plastic bags are well-known to affect nature life's, sea life's etc.For these different reasons, degradation of these petrochemical based synthetic plastics polymers is required. The paper presents review of different approaches to degrades the synthetic plastic polymers to avoid environmental pollution and to preserve an ecological system

Keywords: Biodegradation, Synthetic Polymers, Pollution.

1. Introduction

Nowadays amount of solid waste is increasing due to increase in population, development activities, and changes in to life style and also due to change in socio-economic conditions. These solid wastes, bio-degradable waste means it is easily decomposed or chemically dissolves of material by bacteria or other biological means [1]. Biodegradable matter is generally organic material such as plant and animal matter and other substances originating from living organism. Non-biodegradable waste is mostly the synthetic polymers with petrochemical base i.e., plastics.

The persistent of these synthetic polymers are nowadays major source of environmental pollution. These indirectly affect the preservation of ecological systems and also harming wildlife when they are dispersed in the nature i.e., plastics. The effect of the plastic bags is well synthetic plastics polymers is very necessary. The papers presents on different approaches used to degrade or recycle these synthetic polymers to avoid environmental pollution and to preserve an ecological system.

2. Synthetic Polymer-plastics

Plastics are synthetic substances produced by chemical reaction [2]. Almost all plastics are petroleum based and non-degradable. The properties of plastics are as easily mouldable, cast processed into variety form, including solid objects, films and filaments. These properties arise from their molecular structure. Plastics are polymers, very long chain molecules that consist of subunits (monomers) linked together by

chemical bonds. The monomers of chemical plastics are inorganic materials (such as styrene) and are not biodegradable.

Because of above mentioned properties of plastics, it is replaced by the traditional material like paper, jut, cloth etc. plastics or synthetic polymers are mostly used for packing purpose because of its less cost and convenience. But it is wrong choice because its method of disposal creates pollution problems. They also have very long life time and the burning of plastic waste under controlled conditions could also lead to generation of much hazardous air pollutant depending upon the type of polymers and additive used.

3. Plastics waste management

The main issue with plastics arise when it is of no use and to dispose it off. Plastics take almost 5 to 6 decades to decompose and sometimes this period stretches to more than a million years. Thus plastics waste is a significant portion of the total quantum of solid waste [3]. The environmental hazards due to mismanagements of the plastic wastes include the following aspects:

i) A littered plastic chokes drains and make important public places filthy.
ii) Garbage mixed with plastics, when burnt may cause sir pollution by emitting polluting gases.
iii) Garbage mixed with plastics interferes in waste processing facilities and may also cause problem in landfill operations.
iv) Recycling industries operating in non-confirming areas posing unhygienic problems to the environment, etc.

Thus regulations of plastics wastes, particularly manufactures and use of recycled plastics carry bags and containers are being regulated in country as per ‘Recycle plastic manufacture and usage rule 1999’ and as amended in 2003. The plastic waste has becomes a major issue of the environment pollution, so attempt is made to reuse the plastic waste as follows:

Reuse of plastic waste in road construction:

Plastic waste can be reuse as a binder for the construction of roads [4-5]. Waste plastic is shredded in required size and mixed with hot stone (150-170^{0}C) with uniform mixing. When heated to around a50 to 170, they melt and in that molten state they spread over the stone as thin liquid which acts a binder.

It is observed that stone can also be made to bind with bitumen strongly resulting in better mix for road construction. When plastic is used as binder for construction of roads, it increases the melting point of bitumen. The use of innovative technology not only strengthened the road construction but also increase the road life. Also it helps to improve the environment.

Plasma pyrolysis technology

Plasma pyrolysis technology integrates the thermo chemical properties of plasma with the pyrolysis process. The intense and versatile heat generation capabilities and hazards waste in a safe and reliable

manner [3]. In plasma pyrolysis, the waste is firstly heated in the primary chamber at 850^0C. The waste materials then dissociated into carbon monoxide, hydrogen, methane, higher hydrocarbons etc. Then using air blow (fan) system the pyrolysis gases as well as plastics waste drain into secondary chamber, where temperature are maintained at 10500^0C. These gases are ignited with high voltage spark. The carbon monoxide, hydrogen, methane and higher hydrocarbons are combusted into safe carbon dioxide and water. The conversion of organic waste into the non toxic gases (CO_2, H_2O) is more than 99%. The extreme conditions plasma kill sTable bacteria such as *bacillus stereothermophius* and *bacillus subtilis* immediately. Segregation of waste is not necessary as very high temperature ensure treatment of all types of waste without discrimination.

Plastic waste into liquid fuel

The process of conversion of plastics wastes into liquid is based on random de-polymerization of the plastics waste in the presence of catalyst. The entire process is undertaken in closed reactor followed by condensation. in conversion process, the plastic waste is heated up to 2700 to 3000^0C for conversion into liquid-vapour state which is then pass through the condensing tube cool the gas into its original oil form. This oil can then be further processed to make gasoline, diesel and kerosene.

Conclusion:

From the above discussion it is appeal to the arrange R&D progeam to make plastic more environment friendly. Educate users to right disposal methods. Encourage using reusable begs made up of traditional materials. From above discussion it is concluded that recycling is beneficial only when natural resources are truly saved. It will be beneficial only when the recycling of the products such as trash bags, food packing, construction of road, conversion of liquid fuel, etc. consume less natural resources than simply throwing the product away and making new.

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