International Journal of Engineering, Science and Mathematics
Vol. 7Issue 3, March 2018,
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijesm.co.in, Email: ijesmj@gmail.com Double-Blind
Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

COMPARATIVE STUDY OF BIO-DEGRADABLE POLYMER AND NON-BIODEGRADABLE POLYMER.

DR. RAJENDERKUMAR

LECT. IN CHEMISTRY

GSSS- ALAKHPURA (BHIWANI), INDIA.

Abstract:

Biodegradable polymer (BP) are accepted in modern time due to eco-friendly nature of it in comparison to non-biodegradable polymer (NBP). The great advantage of biodegradable polymer is the conservation of fossil reserve and reduction in Oxides of Carbon, Sulphur and Nitrogen & Hydrocarbon emission. Which are gaseous air pollutant. Use of biodegradable is part of green chemistry.Synthetic NBP are mostly fossilfuel derivative, current global consumption is more than 250 million tones, consume 5% crude oil. There are less problems related to disposal of BP as compared to conventional NBP. Making and recovery of BP have the additional advantage of using renewable resources. Growing environmental need has imposed a shift from biostable Material (NBP) to biodegradable one (BP). The purpose of this paper is to overview issues related to Biodegradable polymer & NBP and decomposition of Biodegradable polymer.

Keywords :

Biodegradable Polymer, Non-Biodegradable Polymer, Green Chemistry, Renewable Resources.

International Journal of Engineering, Science and Mathematics
Vol. 7Issue 3, March 2018,
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijesm.co.in, Email: ijesmj@gmail.com Double-Blind
Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Introduction :-

Use of Non-Biodegradable polymer material is harmful to human health due to phthalates, the chemical compounds used in thermoplastic. Human exposure to these components occurs via food intake and may be related with adverse health effects, especially a disruption of hormonal system. The threat of plastics to the marine environment has been a serious issue. Even the animals feed on plastics by mistake and hence it has entered in the food chain. The studies revealed the presence of PCBs in the Shearwaters birds, tissues due to ingested plastic particles. Their study offered the initial indication that seabirds can assimilate chemicals from plastic particles in their stomachs, representing a hazardous pathway for potentially destructive pollutants. On the other hand, biodegradable plastics with functionalities and process abilities similar to traditional petrochemical used plastic have been developed for packaging applications. Classically, they are made from renewable raw materials such as starch or cellulose. In adding up to performance and cost, biodegradable plastics have even got to offer advantages for waste management systems in order to understand large benefits to the environment.

Below table shows that with increase in use of non-biodegradable polymer there is increase in percentage of non-biodegradable polymer in municipal solid waste (MSW) in comparison to biodegradable polymer.

Table : change in composition of municipal solid waste with time in percentage a report from planning commission of India.

Year	Biodegradable	Non-Biodegradable
1996	42.21	0.60
2005	47.43	9.22
2011	42.51	10.11

Decomposition of Biodegradable Polymers

The decomposition of the biodegradable material sharply depends on the condition provided. Decomposition rate varies with many factors like humidity, temperature, aerobic or anaerobic conditions, depending on the formulation used, and the microorganisms required. Even the material that is subjected to decomposition itself has its different susceptibility towards decomposition. Polymers that are based on naturally grown materials (such as starch or flax fiber) are susceptible to degradation by microorganisms. When biodegradable material (eg. Starch or cellulose) is used as an additive to a conventional plastic matrix, is attacked by the microbes. The microbes start to digest the starch and when the starch component has been depleted, the polymer matrix begins to be degraded by an enzymatic attack results in the slowly reduced weight of the matrix until the entire material has been digested. The different commercial formulations of polythene containing starch as an additive in five different natural and seven different laboratory model environments combinations, at time intervals of

International Journal of Engineering, Science and Mathematics
Vol. 7Issue 3, March 2018,
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijesm.co.in, Email: ijesmj@gmail.com Double-Blind
Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

up to one year. It was founded that of the 232 plastics/environments/time combinations, fewer than 10% showed statistically significant degradation and biodegradation tended to be faster in those with a high starch. As the microorganisms utilize or remove the starch present in the polymer there would be some physical or mechanical damage on the specimen. The process is called depolymerization. When the end products are Carbon dioxide, Water and Methane the degradation is called mineralization

It is important to note that biodeterioration and degradation of polymer substrate can rarely reach 100% and the reason is that a small portion of the polymer will be incorporated into microbial biomass, humus and other natural products. The evaluation of visible changes in plastics can be performed in almost all tests. Effects used to describe degradation include roughening of the surface, formation of holes or cracks, de-fragmentation, changes in color, or formation of bio-films on the surface. These changes do not prove the presence of a biodegradation process in terms of metabolism, but the parameter of visual changes can be used as a first indication of any microbial attach (Shah et al. , 2008). Many biopolymers are designed to be discarded in landfills, composts or soil. The materials will be broken down, provided that the required microorganisms are present. Normal soil bacteria and water are generally all that is required, adding to the appeal of microbial reduced plastics.

Problems and Challenges of Biodegradable Polymer

Products must be developed that satisfy real needs of the public. Performance must meet public expectations and costs must be competitive to those of extent plastic materials used for the same applications. Study of the influence of compounding variables on morphology, physical properties, and biodegradability can provide basis for tailoring properties of starch plastics to fit specific applications. Lower material performance of some bio-based polymers e.g. starch-based materials fell short in strength and impact properties is also a big challenges that need to be successfully addressed.

On the other hand, high cost for production and processing is major obstacle for the development and establishment of biodegradable objects e.g. the cost of starch in Europe is clearly higher than in the US. For starch blends, the main cost component is the modification of starch and this area is of great thrust for considerable for improvement. Use of agricultural land and forests, with maintaining economical viability against the food production demand will be a limiting factor if bio-based products increase in next decades. Adverse effects on biodiversity will be the other environment and ecological issues.

As bio-polymers are modified for the bio-plastic purpose or incorporated with the traditional non=degradable plastic, sustainable disposal, biodegradation and recycling of these semi-biodegradable hybrids are another environmental, economicaland technical concern.

Conclusion

Basic reason for difference in properties of NBP & BP is of structural composition. In NBP there are reactive site absent in NBP while in BP there are functionalities present which under go enzymatic hydrolysis by microorganism of environment & non-biotic components like light air, It is our duty to use eco-friendly polymer in our daily life. By using BP the problem of pollution can be minimized. Our planet can be made more beautiful by use of more & more BP. Time has come legislation should make more comprehensive laws regarding use of BP & NBP.

Refrences :

[1] Koller I & Owen, A.J. (1996) starch filled PHB and PHB/HV copolymer, polymer international 39

[2] Averous, L., Fringant, C. & Moro, L. , (2001) Plasticized starch cellulose interactions in polysaccharides composites. Polymer 42, 6566-6572

[3] Fritz J, Link U, Braun R (2001) Environmental impacts of biobased/biodegradable packaging. Starch 53(3–4):105–109

[4] Karlsson S, Albertsson A-C (1998) Biodegradable polymers and environmental interaction. PolymEngSci 38(8):1251–1253

[5] Kaplan DL, Mayer JM, Ball D, McCassie J, Allen AL, Stenhouse P (1993) Fundamentals of biodegradable polymers. In: Ching C, Kaplan DL, Thomas EL (eds) Biodegradable polymers and packaging. Technomic Pub Co, Lancaster, pp 1–42

[6] Van de Velde K, Kiekens P (2002) Biopolymers: overview of several properties and consequences on their applications. Polym Test 21(4):433–442

[7] Rouilly A, Rigal L (2002) Agro-materials: a bibliographic review. J MacromolSci Part C Polym Rev C42(4):441–479

[8] Chandra R, Rustgi R (1998) Biodegradable polymers. ProgPolymSci 23(7):1273–1335

[9] Municipal solid waste (Management and handling) Rule 2000, Ministry of Environment and forests, Government of India issue on 25 September 2000.

[10] Plastic waste Management rule 4(i)h, 2016.

[11] Plastic pollution Encyclopedia Britannica Retrieved, 2013.

[12] Material safety Data sheet-Ethylene glycol, 2001.

[13] Zareena, B.centre of Excellence in Environmental Economics. Ministry of Environment and Forests, Government of India, 2003.