Environment Conservation Journal 16(3) 33-37, 2015
ISSN 0972-3099 (Print) 2278-5124 (Online)
Abstracted and Indexed

Biolap: Pathway to next generation of laptop

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Received: 31.07.2015 **Revised: 10.09.2015** **Accepted: 05.10.2015**

Abstract

With increase in demand for computers, iPods and mobile phones there is surge of electronic gadgets around the world leading to production of huge quantity of waste term as E-Waste. To reduce the dumping and recovery of precious metals by harmful means from e-waste in developing countries we have develop an innovative solution. Manufacturing of laptops and computers using bioplastic which is partially biodegradable material and have life span of four to five years. By varying the composition of different bioplastic their thermal insulation, structural strength and conductivity can be improved. And would make them perfect to replace acrylonitrile butadiene styrene –common plastic being used in manufacturing of different kind of laptops. Also the segregation of these bioplastic into its constituent's materials is much simpler and easier. This is done by segregating of electronic components made from bioplastic at home or industry level. Further, these bioplastic can be used as a feed for small community based pyrolitic units which will act as a source of syngas and bio-oil. The syngas produced can be used as fuel for cooking and also for supplying back to generators. The biochar left in chamber when mixed with organic fertilizers can be act as source of manure to the soil. As a result with production of zero toxic constituents these bioplastics can meet the ever increasing demands of laptops in developing countries like India.

Keywords*:- *Biolap, bioplastic, generator, fertilizer, syngas

Introduction

Consumer electronics have increased production and have become culturally more important over the past several decades as it has changed how we communicate, or entertain, and get information.

Due to rapid technological advancement in this sector , there is constant stream of new and more enhanced products and as a result there is increase in generation of electronic waste. E-waste consist of a many components, some containing toxic substances that can have an adverse impact on human health and the environment if not handled properly.According to a report by UNEP titled, "Recycling - from E-Waste to Resources," the amount of e-waste being produced - including mobile phones and computers - could rise by as much as 500 percent over the next decade in some countries, such as India. The United States is the world leader in producing electronic waste, produces about 3 million tons each year. As per 2010 estimate China is on second position producing about 2.3 million tons (Pinto, 2008) domestically. And despite having banned e-waste imports, China remains a major e-waste dumping ground for major developed countries.

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According to environmental Protection agency report in 2009 (E.P.A,2011)

- 438 million new electronic products were sold;
- 5 million short tons of electronic products were in storage;
- 2.37 million short tons of electronic products were ready for end-of-life management; and
- 25 percent of these tons were collected for recycling.

And in 2013 the numbers of computers being sold were 289,753,002 and number is constantly increasing. With such a large amount of electronic item being purchased all over the world it is creating a problem of how their disposal should be done in a most efficient way.

To curb this problem we have come up with an innovative solution of making of laptops of biodegradable material i.e. using of bioplastic in making of laptops which would be called BIOLAP. Since acrylonitrile butadiene styrene which is common plastic used in making laptops is a petroleum based plastics. Worldwide we produce about 100 million tonnes of petroleum plastic per year. To make these plastics we use about 7 million

barrels of oil per day. Now imagine that number dropping to zero. With the help of bio plastics, one day that may be a reality.Bioplastics are similar to biomass plastics in that they are made by fermentation of plant sugars, which makes them carbon neutral and eliminates the need for non-renewable petroleum (oil) plastics. The difference is that bioplastics are, by definition, biodegradable or compostable, because their polymers are different from those derived from crude oil, and the chemical bonds are more susceptible to degradation by enzymes produced by natural microorganisms.
Examples: - of bioplastics are polylactic acid (PLA), polycaprolactone (PCL), polyhydroxy butyrate-covalerate (PHBV), and polyesteramide.

Computer	Television	Hard Copy Devices	Mobile Devices
Laptops	CRTs	Printers	Cell phones
Desktops,	Flat –Panel	Fax Machines	Smart Phones
Monitors	Projection	Scanners	PDAs
Keyboards	Monochrome	Copiers	Pagers

Material and Methods

Estimates suggest 200 billion pounds of plastic is produced every year (Kotrba, 2013). Due to the technical limitations or inconvenience of recycling, only a fraction of that material resurfaces in new plastic products.The Pacific Ocean is home of the world's biggest landfill: the Great Pacific Garbage Patch (Kotrba,2013). And unlike biological material, plastic do not biodegrade and decompose. Instead, plastic photodegrades, i.e. it breaks down into infinitely into smaller and smaller pieces without actually chemically breaking down. And as a result , the amount of plastic debris in the Great Pacific Garbage Patch only grows. The tiny plastic bits, called nurdles or "Mermaid tears**,"** are reported to outnumber plankton in the vast region six-to-one and are mistaken as food by bottom feeders and other filter feeders, which poses a threat to the entire food chain. In-coperaration of bioplastic in making of laptops

Table 2 In-coperaration of bioplastic in making of laptops

Main components of laptop	Bioplastic that can be used	Properties
Heat sink tube	Kenaf,fiber-reinforced polylactic Acid[Serizawa,2006]	Can be used for casing of electronic equipment and improve its heat resistance, strength, and formability
LCD/ LED screens	Biofront[Tenjin,2010]	Highly heat resistant Can be used for making films and other parts of laptops
Insulating material	Manufactured from banana peel[Elif,2013]	The bioplastic so formed is insulating material as it has considerable mechanical Strength

Further research is taking place in making conducting material made up of bioplastic. Italian firm Bio-on's bioplastic -- which is totally biodegradable and made from sugar (Clark,2013). cane waste - can now become an electro conductor ,by applying nanotubes Containing grapheme. These bioplastic can be used in making of printed wired board.To make Biolap even more successful lead free soldering is should be used. In this type of soldering instead of lead, copper is used. Organic material which can be used to make biolap even more efficient Batteries which are categorized harmful toxic waste can be made from rice husk as rice husk contains silica and this silica is converted to silicon and use it for high-capacity lithium battery anodes (Jung,2013). Taking advantage of the interconnected nonporous structure naturally existing in rice husks, the converted silicon exhibits excellent electrochemical performance as a lithium battery anode, suggesting that rice husks can be a massive resource for use in high-capacity lithium battery negative electrodes. Research is already in progress at 'Virginia tech laboratories' to develop cheap biodegradable sugar batteries that can perform for about 3 years.

Organic led's solution to the inorganic led using screens of laptops. The organic LED, OLED has many of the properties of a traditional organic LED. It is a PN junction cross which light flows Properties of OLED

1) They are flexible and very thin which make them best suited for laptop.
2) They have very low power consumption.
3) They have wide viewing angle, high contrast ratio.
4) Faster time response.

Bioplastic made up of kneaf are even more successful as it has highest rates of CO2 absorption of any plant. Its photosynthesis rate is 3 to 9 times higher than ordinary plants resins, and is capable of absorbing approx. 1.4 tonnes of CO2 per ton of kenaf. It is thus a very effective plant in terms of global warming prevention. It is now being cultivated in Southeast Asia and many other countries around the world, mainly as a substitute for existing materials for uses such as paper fiber and livestock feed.

Lifespan and end product of bioplastic

Typical lifespan of laptop is about five year but they are often junked before they are broken because of new upcoming technologies, and the best part of bioplastic is that they also have working period of four years. Apart from the organic led and silica made batteries every component mentioned above have working period of four to five years.Bioplastics require less energy to produce than conventional plastics, and they are made with renewable biomass. Since conventional plastics also accumulate in landfills and take thousands of years to biodegrade while many bioplastics can and should be composted, allowing them to biodegrade much more quickly (Climate Progress, 2011). The result is less landfill usage, less pollution, and less waste accumulation in vulnerable ecosystems as well as a greatly reduced carbon footprint.

Results and Discussion

Decomposition of BIOLAP **a**n Innovative solution as bioplastic can be used for making materials starting from cutlery to gadgets like mobile phones. For decomposition of biolap innovative design is suggested. Using pyrolitic chamber to decompose the bioplastic instead of dumping for landfill because methane is uncontrollably released during anaerobic decomposition or using them as compost.Since bioplastic contain about sixty percent of biodegradable material it can be used for as feed to the small pyroltic chamber. Electronic gadgets made from bioplastic are made to segregate at home itself. And then these are used as feed in the pyrolitic chamber. In this chamber biodegradable material would be heated till the temperature of 350 degrees to 700 degrees Celsius. As a result it would contain35 and 50% biochar from the original weight of the biomass; water; and a syngas.

- The syngas produced can be further be used for: Cooking food
- Fuel for automobiles
- Fuel for biodiesel generators which can act as back up units.

Nanocatylyst converts syngas into ethylene and propylene. The key to this new process is a nanocatalyst consisting of iron particles only

0.00002 millimeters stabilized on a carbon nanofibers and syngas is passed across the catalyst and is converted to ethylene and propylene. Ethylene molecules have two carbons linked together and propylene molecules have three carbon chains. These molecules are exactly the same as the molecules derived from petroleum. In fact, they may have advantages in health and safety, because they do not need to be purified of the many carcinogenic and otherwise hazardous constituents of petroleum (EU Bioplastic, 2013). Based on an analysis of two diagnostic samples of syngas from a slow pyrolysis demonstration unit, the syngas stream had an energy content of 8-10 mega joules/kilogram (MJ/kg) with mainly consisting of 10-25% hydrogen (H2), 15-25% carbon monoxide (CO), 8-15% methane (CH_4), and smaller amounts of ethane, propane, ethyl alcohol, and acetyl alcohol.Further, after removal of inorganic material from biochar so left is mixed organic fertilizers and is used as manure for the crop.To further increase the production of syngas and produce bio-oil we can use heating elements i.e. connected across the gasifying chamber. Using this setup even the end products are being used without producing noxious gases or producing any hazardous chemical compound.

Cost analysis of Bioplastic

Bioplastics are moving out of the niche and into the mass market. Although full market penetration is just beginning, a bioplastic material as Bio-based plastic research and development still make up for a share of investment in bioplastics and has an impact on material and product prices.So initially product development like biolap would be costing much but as seen that prices have continuously been decreasing over the last decade. With rising demand, increasing volumes of bioplastics on the market and rising oil-prices, the costs for bioplastics will be comparable with those for conventional plastic prices. According to the PRO BIP studyconducted by the University of Utrecht, bioplastics could technically substitute about 85 percent of conventional plastics, so this is not a realistic short- or mid-term development.

With a share of 1.2 million tonnes (2011) compared to 280 million tonnes total plastic production per year, bioplastics are still only beginning to penetrate the market (EU Bioplastic,2013). However, with increasing availability and a quickly expanding number of products in diverse market segments, round 1.2 million tonnes. But demand is rising with more and more sophisticated bioplastic materials and products entering the market.One of the biggest benefits for investment in bioplastic would be for recycling waste workers who are made to recover precious metals from PCB and laptops by burning them, which is resulting in increasing percentage of nickel, cadmium and their harmful chemicals in their blood.Also with increase in investment it can create jobs in rural areas and in country like India where major part of GDP comes from agricultural sector bioplastic can bring huge boost to the sector.

Further Proposed developments

Since bioplastic are not fully biodegradable as they contain considerable percentage of petroleum products in them, so further development should be to make biobased plastic fully made of organic materials having high strength and heat resistance. As bioplastic is only method to reduce e-waste.

Presenting our concept in short video : https://www.youtube.com/watch?v=dwnAxLb3Sh8

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