

IISC RESEARCHERS FIND A WAY TO SUBSTITUTE FOR SINGLE-USE PLASTICS

Relevant for: Environment | Topic: Environmental Conservation, Sustainable Development, and EIA

Models: Bag, cutlery and tumbler made using biodegradable, material developed at IISc, Bengaluru. | Photo Credit: [SPECIAL ARRANGEMENT](#)

According to a report by Central Pollution Control Board of India, for the year 2018-2019, 3.3 million metric tonnes of plastic waste are generated by Indians. The bad news is that this may well be an under-estimation of the problem. Another alarming statistic is that of all the plastic waste produced in the world, 79% enters the environment. Only 9% of all plastic waste is recycled. Accumulation of plastic waste is detrimental to the environment and when this waste finds its way into the sea, there can be major harm to aquatic ecosystems, too.

Researchers from Department of Material Engineering, Indian Institute of Science, Bengaluru (IISc) have found a way to make a substitute for single-use plastic that can, in principle help mitigate the problem of accumulating plastic waste in the environment.

While plastic waste causes one type of pollution, agricultural stubble burning is responsible for air pollution in several States. In Delhi, for example, the air quality index dips to indicate “severe” or “hazardous” level of pollution every winter, and this is due in part to the burning of agricultural stubble in the surrounding regions.

Indranil Chakraborty, a Research Associate working in the labs led by Suryasarathi Bose and Kaushik Chatterjee, has, along with coworkers, developed polymers using non-edible oil and cellulose extracted from agricultural stubble. These polymers can be moulded into sheets having properties suitable for making bags, cutlery or containers. The material so made is biodegradable, leak-proof and non-toxic.

Non-edible Castor oil was used in this process of making the polymer which involves allowing them to react with the cellulose and di-isocyanate compound. “All precursors are mixed in toluene solvent and heated at 80 degree for 8 hours. Then [we] poured the solution mixture in a teflon sheet and allowed the toluene to evaporate. After 12 hours, nice polyurethane sheet is obtained because of the crosslink between the functional groups present in the precursors,” explains Dr Chakraborty, in an email to *The Hindu*. The sheets are then moulded in compression moulding to make the articles such as a bag or pieces of cutlery.

“We already used castor oil for our experiment. Currently, we are doing the same experiment with other non-edible oils such as jatropha oil and neem oil,” he adds.

The sheets of polymer made were subjected to a leaching test and were also tested for thermal stability and were found to hold against the tests. These preliminary tests suggest that the material can be used for food packaging. Further tests are on to establish the sheet as food-grade.

In order to obtain sheets with properties like flexibility suitable for making different articles, the researchers played with the proportions of cellulose to non-edible oil. The more cellulose they added, and less non-edible oil, the stiffer was the material, so that it was more suitable to making tumblers and cutlery. The greater the proportion of oil, the more flexible was the material and it could be moulded into sheets for making bags.

While Indranil Chakraborty designed the experiment, synthesised the sheet, and moulded it to make the articles, Pritiranjana Mondal characterised the material. The group has already filed a provisional patent.

“As the material is bio-degradable and non-toxic, we are planning to use the material for healthcare applications also,” says Prof. Chatterjee. “We are in discussion with various companies for technology transfer.”

“Given the surge in the usage of single use plastics and the challenge of managing the landfills choked with SUPs, such alternatives could bring paradigm shift especially in packaging sector, the largest consumer of SUPs,” says Prof Bose.

[Our code of editorial values](#)

The study has been published as a letter in the ‘Astronomy and Astrophysics’ journal

END

Downloaded from **crackIAS.com**

© **Zuccess App** by crackIAS.com