

Statement of Research Interest

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I am applying for a joint doctoral program of IIT Kharagpur and University of Manchester, project “Sustainable management of plastic waste”. As we grow from infant to senescence we widely use plastics nevertheless we never give a thought of its life span on the earth. I, being a student of environment, am always curious about how this so beneficial and integral product of human life is creating havoc to the environment.

Synthetic plastic was introduced to the world around 114 years ago. Then it was not known that it would become a prominent part of the world. Since it is cheap, thermally and electrically insulated, water and shock resistant and lightweight with high tensile strength it gains massive recognition and is widely used for different purposes. In 1950, it started gaining a place in the market. Since then, there is no going back, the production of plastics increased tremendously. However, plastic wastes become problematic to the world because of the resistance against degradation process and persistence in the environment for longer duration. In 2016, the global plastic waste production was estimated to be 322 million tons. As plastics have a short life of application which is leading to a contribution of 12% in municipal solid waste. The properties which make plastics beneficial meanwhile makes it troublesome for the environment, it cannot get degraded but can be converted into smaller particles which are commonly called microplastics. These microplastics are massively creating havoc for the environment, as it enters the food web. Nowadays, plastics have become inevitable; one could reduce its use to decrease its pile of waste but cannot eliminate it completely. What can we do then? We generally opt for its incineration, recycling. Plastics are generally polymers made up of several monomers. There are 80% plastics which are thermoplastics whereas 20% are thermosetting. However, there is one differentiation based on the polymer and it is divided broadly into 7 types. Prior to recycling it is preferred to segregate the plastics based on its polymer and then go for recycling. Recycled plastics find their applications in different purposes.

The plastic polymers contain hydrocarbons, so, we will utilize this hydrocarbon in producing energy. Pyrolysis is the thermochemical process for degradation of waste at different temperatures (300-900 °C), in the absence of oxygen, to produce liquid oil. Through the pyrolysis process we can eliminate the tonnes of plastic waste from the earth and convert it into useful fuels. In recycling, there is need for segregation of different polymers of plastic for the further manufacture of useful products whereas in pyrolysis there is no need of segregation, all it needs is a homogenous mixture of it and some catalysts.

Pyrolysis of plastics which will give fuel can be further used in energy generation. This way not only we get the energy from the plastic wastes but also reduce the burden of it from the earth and reduce the pressure on natural resources as well on which we rely for energy generation.