

Bioplastic and its Applications in the Automotive Industry

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Bioplastic is a unique polymer that comes from organic feedstocks. A feedstock is any based material that is used to make a piece of plastic. Common feedstocks used in bioplastic include corn starch, soy beans and tapioca. As the world becomes more connected and the waste stream expands, we need to come up with better ways to manufacture and reuse plastic material.

On average, people in the United States throw away about 60 billion pounds of plastic a year. In Western Europe, this figure is as high as 35 billion pounds. With all this plastic being stored in the landfills, the amount of green house gases being emitted increases each year. For example, one sixteen (16) ounce plastic bottle produces one kilogram of carbon.

One of the areas where plastic is heavily is in the automotive industry. A car, on average, has over 20,000 different parts which are often made from petroleum based plastic. For example, companies like Delphi Automotive and Ford Motor Company use petroleum based plastics to make everything from car interiors to bumpers. There are different plastics that are used to produce a car. For example, some parts such as oil pans are made from PET resins. According to data from 2005 PlasticEurope, it takes roughly 0.4 gallons of crude oil to make 1 pound of plastic. Globally, around 8 percent of the oil that comes out of the ground is used to make plastic.

With the heavy use of petroleum plastic, we need to identify opportunities to use more environmentally friendly plastics. A part that is often overlooked but holds great potential for bioplastic is the ventilation duct. It is used to circulate fluids. Other parts of a car that can be made from bioplastic materials are headliners, floor mats, seat cushion foam, side trim, inner and outer scuff plates, and deck trim covers.

There are a number of automotive companies that have started working on these innovations. For example, Ford Motor Company, headquartered in Dearborn, Michigan, started using soy foam blend in headliners back in 2010. In 2011, Toyota started using a bioPet material which is made from sugar cane in the Lexus CT200h. The company is pushing to replace 20 percent (by weight) of all oil-based plastics for cars with bioplastics by 2015.

There are a number of benefits to using bioplastic in automotive manufacturing. First, bioplastic is more carbon neutral than conventional petroleum-based plastics, meaning it can lessen product-life-cycle carbon dioxide emissions. Second, using bioplastic can lead to a reduction in the use of limited petroleum resources. Third, it helps reduce the weight of the cars which leads to better fuel efficiency.

In conclusion, bioplastics are a revolutionary material that is changing how cars are made. Currently, it is being used to make a few components, but as chemists and engineers become more aware of its benefits, more car parts will be biobased. Over the past year I have done experiments on bioplastic at Ecotek Lab. This experience, coupled with my love of science, will hopefully allow me to contribute to the growing field of green material science in the future.