Plastic that degrades in seawater could be boon for cruise industry and others

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Large volumes of plastic waste generated aboard military, merchant and cruise ships must be stored onboard, often for prolonged periods, until they make port. In the future, a new type of environmentally friendly plastic that degrades in seawater may make it safe and practical to toss plastic waste overboard, freeing-up valuable storage space, according to scientists at The University of Southern Mississippi (USM).

The biodegradable plastics could replace conventional plastics that are used to make stretch wrap for large cargo items, food containers, eating utensils and other plastics used at sea, the researchers say. The biodegradable plastic has not yet been tested in freshwater. The development was described today at the 233rd national meeting of the American Chemical Society.

“There are many groups working on biodegradable plastics, but we’re one of a few working on plastics that degrade in seawater,” says study leader Robson F. Storey, Ph.D., a professor of Polymer Science and Engineering at USM, located in Hattiesburg, Miss. “We’re moving toward making plastics more sustainable, especially those that are used at sea.”

Conventional plastics can take years to break down and may result in byproducts that are harmful to the environment and toxic to marine organisms, conditions that make their disposal at sea hazardous. The new plastics are capable of degrading in as few as 20 days and result in natural byproducts that are nontoxic, Storey and his associates say. Their

study is funded by the Naval Sea Systems Command (NAVSEA), which is supporting a number of ongoing research projects aimed at reducing the environmental impact of marine waste.

The new plastics are made of polyurethane that has been modified by the incorporation of PLGA [poly (D,L-lactide-co-glycolide)], a known degradable polymer used in surgical sutures and controlled drug-delivery applications. Through variations in the chemical composition of the plastic, the researchers have achieved a wide range of mechanical properties ranging from soft, rubber-like plastics to hard, rigid structures, depending on their intended use.

When exposed to seawater, the plastics degrade via hydrolysis into nontoxic products, according to the scientists. Depending on the composition of the plastics, these compounds may include water, carbon dioxide, lactic acid, glycolic acid, succinic acid, caproic acid and L-lysine, all of which can be found in nature, they add.

Because the new plastics are denser than saltwater, they have a tendency to sink instead of float, Storey says. That feature also could prevent them from washing up on shore and polluting beaches, he notes.

The plastics are undergoing degradation testing at the U.S. Army Natick Soldier Research, Development, and Engineering Center in Natick, Mass., and in the Gulf of Mexico at the USM Gulf Coast Research Laboratory in Ocean Springs, Miss. Initial results have been favorable, Storey says.

The plastics are not quite ready for commercialization. More studies are needed to optimize the plastics for various environmental conditions they might encounter, including changes in temperature, humidity and seawater composition, Storey says. There also are legal hurdles to overcome, since international maritime law currently forbids disposal of

plastics at sea.

Source: American Chemical Society