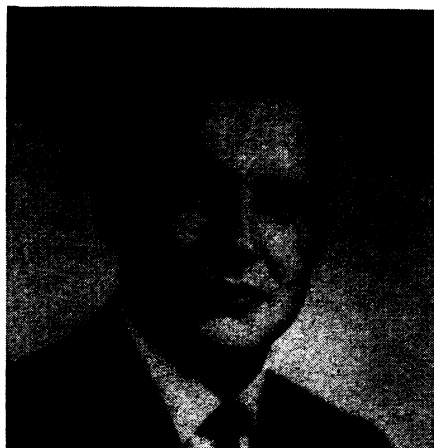


This plastic will self-destruct

Univ. of Toronto

Guillet: Degradable plastic bottles.

Ever since plastics were invented, polymer and physical chemists have been working to give the materials more strength. Plastics have come a distance since the 1940's, when they were rather brittle, to 1971, when they can be as tough as steel. In the past year or so, however, public indignation over litter and garbage has caused industry to ask chemists whether self-destructing, or quickly degradable, plastics might be devised to replace indestructible, unburnable and incompressible glass, aluminum and plastics, which comprise the largest segment of consumer waste.

Chemists say that they have the techniques for lengthening or shortening the lives of plastic products or soon could develop such techniques. This is based on research undertaken in the past 20 years to understand how light interacts with the large molecules that make up plastics and natural polymers.

Drs. Dave Carlsson and D. M. Wiles of the National Research Council of Canada in Ottawa who spoke at the 23rd International Congress of Pure and Applied Chemistry in Boston last week (see p. 93), have found that polypropylene, which goes into packaging, upholstery, rope, carpets and other consumer products, can be degraded by photooxidation (oxidation induced by light) that takes place in a thin skin of the fiber. That is, the surface of the plastic molecule is photooxidized. As a result of this surface reaction, the polymer begins to degrade and eventually becomes brittle. Some commercial companies in Canada, Japan and Europe are now considering using this discovery to incorporate chemicals into the vulnerable area of the plastic molecule that will make it degrade quickly. Says Dr. J. E. Guillet of the University of Toronto, who is a consultant to Ecoplastics Ltd. of Toronto: "If we

can control the rate of these surface reactions, we have the key to making polypropylene degrade at will."

Another approach that Dr. Guillet and his associates at the university have come up with may be of even greater importance. "The plastic polymer contains chains of atoms that wind back and forth on themselves," Dr. Guillet explains, "which is what makes the molecules strong. But if you introduce certain molecular groups at areas along the chains that are especially sensitive to light, the chains break and the strength of the plastic deteriorates to the point where it will fall apart during natural erosion."

It has taken Dr. Guillet and his team a number of years to arrive at this technique. He has now devised a self-destructing plastic that is about ready for marketing—a wrapping paper that disintegrates in about a month.

Some soft drink companies in the United States are already test-marketing plastic bottles. Meanwhile, at industry's prompting, Dr. Guillet is tackling the development of a degradable plastic bottle. Dr. Carlsson says this will not be particularly easy, since plastic bottles now being considered by soft drink companies are "pretty stable, like carpets."

But the overriding question is: Will the public pay for the basic research to reverse chemists' years of effort to make plastics harder? Will the public accept plastic bottles as a replacement for glass ones? "Although the plastic soft drink bottles being test-marketed are good imitations of the glass ones," Dr. Carlsson says, "it could take several years before the plastic bottles are accepted by the public. Finally, will the public accept products which don't have long shelf lives, which won't stay around in their closets forever?"

Making the public decisions on these questions even harder is current confusion over whether self-destructing plastics are the answer, or even a partial answer, to litter and garbage problems. Durable plastics comprise a large portion of offensive litter and up to 20 percent of disposable solid wastes.

The confusion isn't limited to the public and legislators; even chemists working with weakening and strengthening plastics are somewhat at odds over the approaches which should be taken to litter and disposable wastes. Dr. Guillet favors rapidly degradable plastics, which he says can replace most glass and metal containers and wrappers on the market. Dr. Carlsson leans more toward recyclable plastics, provided the public can be educated to recycle them. "Much of the litter problem is a social one," Dr. Carlsson asserts, "because those people who return bottles and containers are not the people who litter in the first place." □

An idea whose time has come

The United States of America is the last major nation in the world to remain committed to the customary system of units of measurement, the history of which goes back to ancient times. Those units, the foot, the pound, the mile, the cup, were supposed to form an international European standard in the Middle Ages, but uniformity among the various national standards was never achieved. These discrepancies, plus the difficulty of calculating in the old system with its 12's and 36's and 16's and 32's led the Europeans to invent a new system, the metric system, in the 18th century. Gradually nearly all the world has adopted it.

Now the U.S. Secretary of Commerce, Maurice H. Stans, is recommending to Congress that this country officially change its common usage from the customary to the metric system. The recommendation is the result of a three-year study commissioned by Congress and undertaken by the National Bureau of Standards (SN: 7/6/68, p. 10). Basically, the study found that the question is not whether the United States will shift to metric measurements—that is gradually happening and has already been accomplished in some sectors of industry—but how. The study, which was directed by Daniel V. De Simone of the NBS, concludes that it would be better to go by plan than haphazardly.

The study presents no detailed plan. It is hoped that Congress will hold hearings and legislate a plan, but the study presents some general principles. For instance, it will not be necessary to change the sizes of many things: the heights of mountains or the width of railroad tracks will simply be expressed in meters and centimeters. On the other hand, things like milk containers will eventually be converted to round metric units.

One of the important things the study found is that American people generally are rather ignorant of the metric system. To facilitate understanding, a campaign of public education will be necessary, the report notes. It will also be desirable to change over economic sectors with direct impact on consumers, such as retail selling, as quickly as possible.

In the butcher shops and groceries, the report foresees a period when both systems will be used together with the metric gradually taking over. The same would happen in such sectors of industry that are not already on metric standards. Capital machinery would be changed in many cases only as depreciation required replacement. □