

Green chemistry: A key to making sustainable, non-toxic products

By Amy S. Cannon and John C. Warner, Center for Green Chemistry, University of Massachusetts Lowell
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What is green chemistry? How does it relate to you?

Green chemistry is the design of products and processes that reduce or eliminate the use and generation of hazardous substances. Sounds simple, doesn't it? Well, it is perhaps a bit more difficult than it sounds... but, just because something is difficult doesn't mean it is not worth doing.

Green chemistry focuses on the invention and design stage of a product's life-cycle. The idea is that if we instill in chemists a knowledge of toxicity and mechanisms of environmental harm, then the chemists will be able to use that knowledge to create safe, non-toxic products in a safe, non-toxic manner.

A question that might pop into your head is, "So you mean chemists haven't always deliberately tried to make safe products?" Well, the answer to this is 'no', we haven't. Why is that? To put the answer simply – we have just not been taught how to do it. It has not been in our vocabulary or in our knowledge base.

If you went to school to study chemistry at any level (B.S., M.S., Ph.D.) you most likely never took a course on anything to do with the environment. You did not take a course on toxicology to understand the hazards associated with chemicals. You did not take an ecology course to understand impacts on the environment. There has been no room for these courses in an already jam-packed curriculum. Traditionally, this knowledge has been left for "someone else" to learn. It has been the environmental scientists' job to deal with the waste and hazards that chemists create in the design and manufacture of products.

Green chemistry seeks to change this by teaching chemists and scientists to understand environmental science and toxicology from the outset, so they can have the *greatest* impact on pollution prevention and reducing waste and hazards.

All along the life-cycle of the product there are interactions with the environment that need to be considered. Molecules and materials come from the environment initially. As the product is being researched, developed and manufactured, waste is created and disposed of, energy is used, effluent is released, etc... And products will return to the environment at the end of their use through disposal, composting, degrading or incineration.

We believe that green chemists need to make the upfront decisions about chemicals and materials that will impact the product's life-cycle. Green engineers need to implement the most efficient and safest processes in the development and

manufacture of a product. Policy makers need to choose the best suitable alternatives that exist and ensure that the products on the shelf are safe.

From the point of view of industry, the product must perform effectively for the consumer. The product must be economical – for the industry to produce and for the consumer to purchase. The product will also have certain social implications associated with its use and distribution, such as being attractive or convenient to use. Only now are green products becoming widely desirable.

Can you imagine a future where all products are designed to be safe at conception? We would no longer have to determine which skin-care product is the safest or which cleaners will be safe to use within our homes.

Industries are climbing on board as they find out about the economic benefits of green chemistry.

Governments are beginning to implement legislation supportive of green chemistry efforts, recognizing that economic development and sustainability can go hand in hand.

Perhaps most importantly, students are signing up in droves for classes and programs where they can learn how to do chemistry in a way that does not have to hurt the earth or human health. It is, after all, the next generation that will lead the path towards building a sustainable world with safe, non-toxic, effective products. And, it is for them and their future that we need to support these efforts. Together we can make the world a safer place.

Amy S. Cannon (Amy_Cannon@uml.edu) is Assistant Professor, Center for Green Chemistry, U Mass, Lowell, www.greenchemistry.uml.edu. John C. Warner (John_Warner@uml.edu), Professor of Plastics Engineering, is the Director of the Center for Green Chemistry.