Are Biobased Products Clean and Safe?

Jim Lane

By Steve Hentges, special to The Digest

In a recent column, GFBiochemicals Chief Commercial Officer Marcel van Berkel wrote about the potential of levulinic acid as a biobased platform chemical. As an example, he mentioned that health concerns have been raised about bisphenol A (BPA, a widely used synthetic chemical) and that diphenolic acid (DPA, derived from biobased levulinic acid) can replace BPA.

We fully agree that safety and performance are critical parameters for any chemical, whether a synthetic chemical such as BPA or a biobased chemical such as DPA. Although beyond the scope of Mr. van Berkel's article, the readers of *The Digest* deserve a more complete discussion of this topic.

Government Agencies Worldwide Support the Safety of BPA

With a more than 50-year safety track record, BPA is certainly one of the best tested substances on earth. Of particular importance is a series of more than 20 in-depth studies conducted by U.S. federal government scientists over the last 5 years to answer key questions and clarify uncertainties about the safety of BPA.

Based on the results of these and other studies, the U.S. Food and Drug Administration (FDA) recently answered the question "Is BPA Safe?" with a clear answer – "Yes." The European Food Safety Authority (EFSA) recently released its comprehensive re-evaluation of BPA and, similar to FDA, EFSA's scientific experts concluded that "BPA poses no health risk to consumers of any age group (including unborn children, infants and adolescents) at current exposure levels."

BPA Has Been Used for Decades Because It Performs Well

The two primary uses for BPA, accounting for about 95% of all BPA produced, are to make polycarbonate plastic and epoxy resins. Both are high-performing materials that have been increasingly used for about five decades in a wide range of consumer and industrial applications.

Polycarbonate is highly shatter-resistant, lightweight and optically clear, which makes it unique among the wide range of commercially available plastics. From protective eyewear to skylights, life-saving medical devices to sports safety equipment, and automobile components to electronic equipment, the global market for polycarbonate continues to grow for a very simple reason – it performs very well in a diverse range of products.

Epoxy resins have a unique combination of toughness, chemical resistance and strong adhesion and are widely used in products that we rely on every day. Epoxy resins are well suited to coating applications but also find growing use in high-strength/light weight composites. Common examples include paints and protective coatings, aerospace composites, wind turbine rotor blades, and printed circuit boards. Epoxy resins have been used for 50 years or more, and new applications continue to be developed today.

Is There a Good Reason to Replace BPA?

In light of the strong scientific and government agency support for the safety of BPA, along with its versatility and high performance, is there any good reason to replace BPA? If safety is the concern, FDA has already addressed it, and the simple answer is no. Replacement of BPA can only be defended for alternatives that, in fact, deliver better

performance or are safer than BPA. Given the high performance of polycarbonate plastic and epoxy resins, and the long safety track record of BPA, those challenges will be very hard to meet.

Is DPA Up To the Task of Replacing BPA?

That question is best answered by the marketplace. Although there are a number of considerations to take into account when selecting materials, hard facts should drive the decision with safety and performance at the top of the list. In the case of BPA, the hard facts are that BPA has been determined safe by numerous government agencies worldwide and its performance is tough to beat.

For DPA, performance and safety are works in progress. As noted by the U.S. National Toxicology Program when it considered conducting basic safety testing on DPA, "Very little information on the toxicity of diphenolic acid was found in the available literature." That should not deter further development of DPA, but it does deserve further attention to avoid a regrettable substitute that compromises product safety or performance.

About Steve Hentges, Ph.D.

The author leads the Polycarbonate/BPA Global Group, which consists of the leading global manufacturers of BPA and polycarbonate plastic. This group of the American Chemistry Council sponsors health and environmental research and supports a wide range of communications and advocacy activities. Steve holds a Ph.D. in organic chemistry from Stanford University and a B.S. in chemistry from the University of Minnesota. In his current position, he has been deeply involved with the science on BPA for more than 14 years. The author periodically writes about the science of BPA in a Science 2.0 column here.