

This report provides an analysis and evaluation of the current and prospective opportunities surrounding engineer-grade bioplastics, specifically those opportunities associated with Eugene Chen's technology enabling the rapid production of acrylic bioplastics by organic catalysts.

The global use of bioplastics was 0.64 million metric tons in 2010 and 0.85 million metric tons in 2011. Analysts expect that the use of bioplastics will increase up to 3.7 million metric tons by 2016, a compound annual growth rate (CAGR) of 34.3%. The European market segment accounted for around 34% of the global market in 2010 and was nearly 0.21 million metric tons. This segment increased to 0.3 million metric tons in 2011 and will further grow to 1.2 million metric tons in 2016, a CAGR of 32.1%. The American market accounted for around 37.5% of the total market in 2010 and was 0.24 million metric tons. Analysts have forecasted that the American market will increase from 0.3 million metric tons in 2011 to 1.2 million metric tons by 2016, a CAGR of 33%.

Interest in making best use of natural resources—as a means to reduce society's reliance on synthetic petroleum-based chemicals—is increasing due to the general interest in a low-carbon economy. In some cases, the driver for using more bio-based chemicals will be the needs of these consumers. However, in many cases, the benefits will be primarily for producers of chemicals and materials, or the end-product OEMs (specifically the transportation and construction & utilities industries), through benefits such as sourcing flexibility.

The current desire within the chemical industry to move to more bio-based feedstocks is a clear trend; however, the reasons behind it are complex. A recent survey of senior managers of miscellaneous chemical companies suggests there are four key mega trends driving this change in the chemical industry<sup>1</sup>:

1. Development of a low-carbon economy
2. The need to enhance functionality and performance
3. Improvements in health and wellness
4. Globalization of people, products, and processes

The auto industry has been identified as a potential primary consumer of end-products similar to that created by this technology – specifically thermoplastics. The auto industry is unique in that, although it represents a relatively small

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<sup>1</sup> Balmer, B. A Bio-based Future for the Chemicals and Materials Market. *Frost and Sullivan*. December 2011.

proportion of total usage of chemicals such as thermoplastics, it is one that chemical companies are most keen to promote as a market that their products are used in.

Fabrication of plastics from naturally renewable feedstocks offers the potential for a cost effective and sustainable alternative to petroleum-based plastics. Biomass-derived polymers based on butyrolactone have been recognized as a potential substitute for plastics derived from petroleum-based polyacrylics, but systems suitable for large-scale production have not yet been developed. Researchers at Colorado State University have addressed this problem by developing a method to synthesize polymers from a class of renewable compounds. The sustainability and advantageous properties exhibited by this technology make it an excellent candidate to displace petroleum-based alternatives.