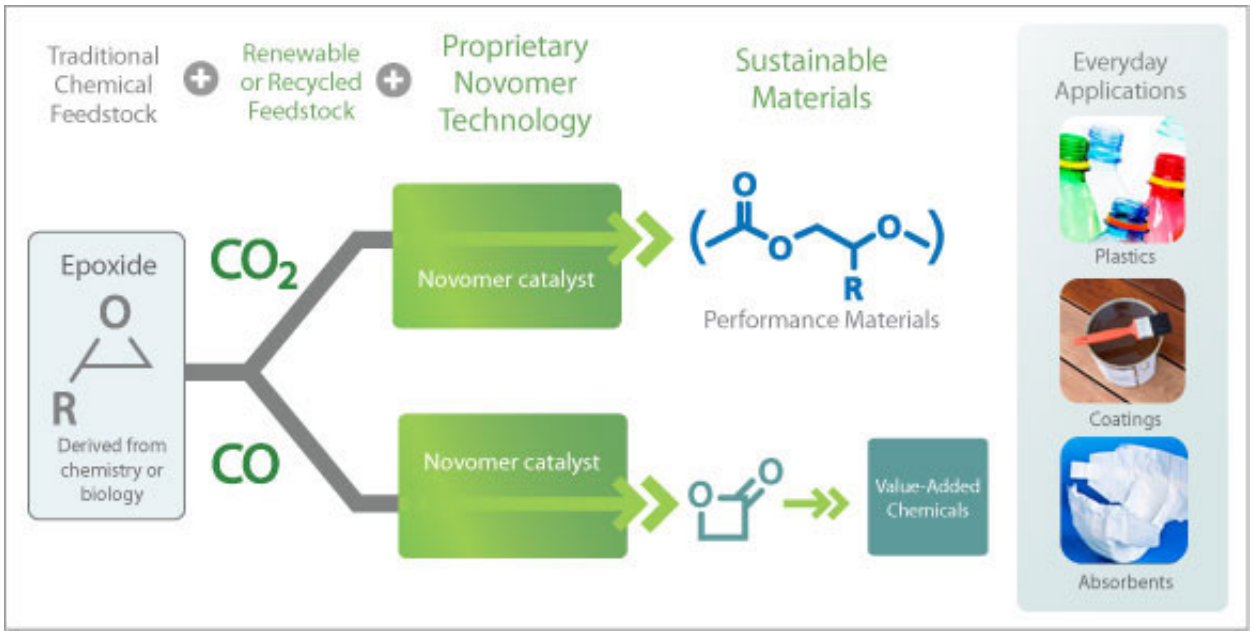
Breaking Energy

INNOVATION, INVESTMENT, TECHNOLOGY

CO2-based Plastics and Polymers Attract Powerful Investors

By ED DODGE
on January 30, 2014 at 12:00 PM



Novomer is a small start-up chemistry company developing novel methods for converting waste carbon dioxide, CO_2, into useful plastics, polymers and chemical intermediates. Novomer has developed proprietary catalysts that react with CO_2 and allow it to bond with other molecules.

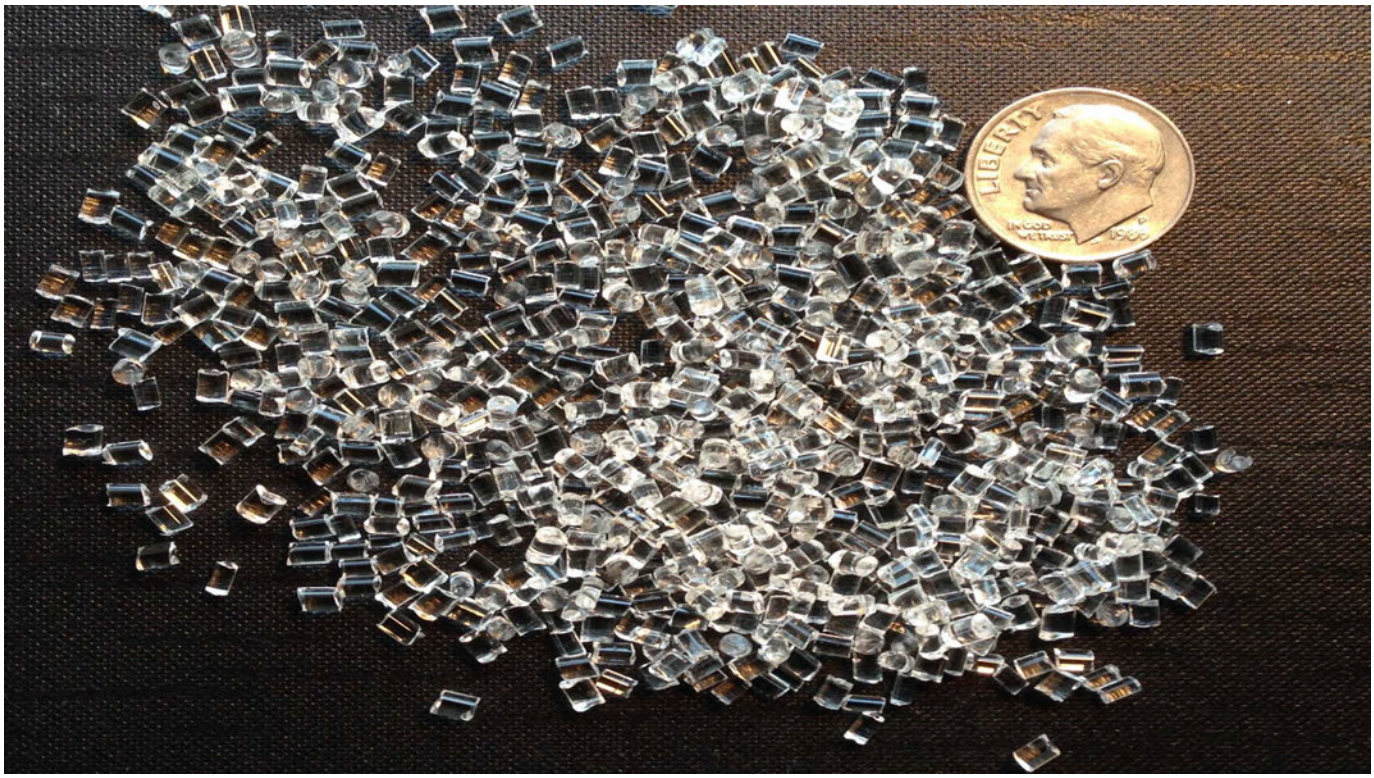
CO_2 is a difficult molecule to work with for the same reasons that it accumulates in the atmosphere, because it is not particularly reactive. CO_2 represents the end of the line for many chemical reactions. In nature, plants use photosynthesis powered by sunlight to convert CO_2 into glucose sugars. In the chemicals industry catalysts are used to initiate chemical reactions between molecules.

Traditionally, chemists had a great deal of trouble finding suitable catalysts that would react with carbon dioxide. Processes such as those used to produce aliphatic polycarbonates date back to the 1960's but require expensive catalysts, high temperature and pressure and produced an expensive product with a limited market. Novomer uses a cobalt based catalyst developed by company founder Prof. Geoffrey Coates at Cornell University. Novomer's proprietary catalysts are non-precious metals based and can be synthesized in the lab in a few simple steps and the reactions take place at normal temperatures and pressures.

Coates and his team, including co-founder Scott Allen, were intrigued by the possibilities of making use of CO_2 because it is an inexpensive feedstock that they believed offered competitive advantages. Initially they pursued biodegradable plastics, and while that remains an option, they shifted to non-degradable products as debate over climate change heated up.

The potential market for plastics as a carbon sequestration solution could be huge, though Novomer is not claiming to be able to save the climate with their product if only because they are working with much smaller quantities of CO_2 than is required to offset the carbon released from burning coal and oil. Novomer is focused on price and performance and taking advantage of the possibilities the CO_2 offers as a raw material. To succeed in the market, Novomer's products must be competitive on their own merits without any sort of green marketing or government subsidies.

Novomer's materials can be engineered as thermoplastic polymers suitable for hard plastics or as polyols used as a base for polyurethane products such as foams, coatings and adhesives. Traditional plastics like polyethylene and polypropylene are long chain hydrocarbon molecules derived from crude oil or natural gas. Novomer is able to replace many of the carbon molecules with CO_2 and reduce the amount of fossil fuel raw materials used.



Novomer thermoplastic pellets are 40% CO2 by weight.

According to Scott Allen, "Polycarbonate polyols that are produced through a different process are well known in the polyurethane industry and are only used in the most demanding applications due to their high cost. The market potential for Novomer's polyols, which use waste CO_2 as a key raw material, is considerably larger as they provide the expected high performance but at much lower price points."

In addition to developing its carbon-dioxide-based products, Novomer is also looking to partner with chemical manufacturers to commercialize its process of using ethylene and carbon monoxide to manufacture acrylic acid, used in diapers and many other products, and butanediol, which is used in the manufacture of plastics and fibers.

In 2010 the company received a $20.6 million grant from the U.S. Department of Energy to commercialize its polymers. The company teamed up with chemical maker Albemarle and Eastman Kodak to scale up its process and manufacture larger quantities of the material for customer testing.

In December, 2013 Novomer announced a venture capital investment by Saudi Aramco Energy Ventures LLC which will fund ongoing development of the technology platform and enhancement of the sales and marketing organization.

Novomer's research and development facilities are located in Ithaca, NY in addition to a commercial development lab in the Eastman Kodak Research Complex in Rochester, NY and a business office in Waltham, MA.

Topics: Carbon Dioxide, Carbon Dioxide Capture, Cleantech Startup, Climate Change, Innovation, Investment, Petrochemical Manufacturing, Petrochemicals, Plastics, Saudi Aramco, Startups, Technology