

Specialty Enzymes Business Unit

FACTSHEET



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Verenium Corporation: Global Leader in Enzyme Discovery and Evolution

What are enzymes?

Enzymes are specialized proteins that accelerate (catalyze) chemical reactions and are essential in all living systems. Without enzymes, biological processes would occur much too slowly to sustain life. In fact, enzymes are so powerful that one single enzyme can process a million molecules every second.

Microbes, such as bacteria or fungi, are abundant sources of unique enzymes and can be found in almost every ecosystem, including oceans, deserts, rain forests and arctic regions. Through generations of natural selection in these extreme and diverse environments, microbes have developed broad and varied characteristics which allow them to survive in environments of extreme temperature, pressure, pH and salinity. As a result, the microbial world provides a rich source of highly diverse genetic material.

How does Verenium find and identify enzymes?

In the quest to discover novel products, Verenium has pioneered the field of "bioprospecting". This has enabled the company to tap into the vast genetic resources of the microbial world by venturing into varied and often hostile environments, such as volcanoes and deep sea hydrothermal vents. Because the harsh temperatures and pH conditions in which these "extremophiles" live often mimic conditions found in today's industrial processes, extremophilic microbes represent a valuable source of potential products.

Through the use of Verenium's proprietary technologies, microbial DNA is extracted directly from collected environmental samples, and expression libraries are constructed and screened using high throughput technologies. This provides access to previously untapped biodiversity from natural resources. Verenium can also rapidly cultivate and isolate mixed populations of microorganisms using groundbreaking methods. The enzymes may be directly commercialized after expression and manufacturing, or may be further optimized and tailored for commercial application by Verenium's state-of-the-art evolution technologies.

What is the role of enzymes in commercial applications?

Enzymes play a vital role in a wide variety of commercial applications in the specialty industrial processing, biofuels, and health and nutrition markets.

Specialty Industrial Applications:

Verenium provides novel products to address a variety of commercial applications in this area. Our product, Phyzyme®-XP* enzyme, in partnership with Danisco, improves the nutritional value of feed for poultry and swine while reducing phosphate pollution. Fuelzyme and Veretase enzymes reduce chemical usage and improve the economics of processing starch into ethanol for fuel, beverages, and sweeteners. Purifine® enzyme provides a novel method for removing phospholipids (oil degumming) while increasing oil yield in oilseed processing for edible oils and biodiesel. Our Luminase® enzyme product line is used in the pulp and paper industry to effect bleaching with reduced use of harsh chemicals such as chlorine dioxide. Cottonase® enzyme is used for textile processing including fading of blue jeans. Pyrolase® enzyme allows for improved yields in petroleum oil field recovery operations. Verenium continues to leverage its proprietary enzyme discovery and evolution technologies to develop products for application in a variety of industrial sectors. In many cases these efforts are in collaboration with blue chip industrial leaders such as BASF, Bunge and Cargill which provide strategic market positions.

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Biofuels Applications:

Verenium's first biofuels product, Fuelzyme® enzyme, is designed to significantly improve the efficiency and economics of ethanol production from corn. It has helped ethanol producers reduce the dosage of enzyme, reduce use of chemicals in the process, and in many cases, realize increased ethanol output.

Production of biofuels, such as ethanol, from non-food plant biomass requires enzymes to break down the cellulose (the structural component of the primary cell wall of green plants) and release sugars, which are then fermented by specialized microorganisms to generate ethanol. Verenium has been partnering with industry leaders to develop next-generation cellulosic ethanol. For example, in partnership with the Department of Energy's Joint Genome Institute, InBio, and the California Institute of Technology, Verenium mined microbial genomes from a termite digestive system to identify new, efficient enzymes for processing of cellulosic biomass. Verenium is now focusing on the commercial development of ligno-cellulosic enzyme (LCE) cocktails to permit access to sugars for production of ethanol from non-food plant biomass. This product will lower the cost of ethanol production substantially as well as completely alleviate any food-fuel tensions since it permits use of the waste components of plants.

**Phyzyme is a registered trademark of Danisco*

