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Interviews with Eben Bayer, CEO of ecovative design are available in Washington, D.C., New York City, and Troy, N.Y.

For TV Producers: B-roll is also available. ecovative design website: www.ecovativedesign.com

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New Natural Material Replaces Petroleum-Based, Non-Biodegradable Polystyrene

Rensselaer Students create new field from mushroom roots & agricultural waste

Troy, N.Y. – Two young Rensselaer Polytechnic Institute graduates are taking on the multi-billion dollar polystyrene packaging and insulation industries with their revolutionary, low-cost biomaterial made of mushroom roots and agricultural wastes no one else wants.

The new composite is sustainable, structurally strong and fire-resistant. It requires almost no energy to produce, leaves no waste, and is biodegradable.

Eventually this unique biomaterial could replace the petroleum-based polystyrene, which is not biodegradable and fills up almost 30 percent of U.S. landfill space.

Made of tiny mushroom roots, called mycelium, and agricultural wastes –rice, buckwheat hulls or cotton burrs— the new material self-assembles and grows together in the dark in a matter of days. A cubic inch of material has about six to seven miles of mycelium fibers, giving it massive strength.

“We are producing the ultimate environmentally responsible green material that performs better than polystyrene,” says Eben Bayer, a co-inventor of the new material. “It is created from waste products; it is produced with ten times less energy and generates eight times less carbon dioxide emissions than polystyrene. When it is disposed of, it has a positive impact on the natural environment. All this for about the same cost as polystyrene packing material which is filling up our waste sites.”

Mr. Bayer reports that clients like the fact "the new material, called *EcoCradle,* is instantly recognizable as an environmentally friendly packaging material."

New field emerges from innovation workshop at Rensselaer

Mechanical engineering students Eben Bayer and Gavin McIntyre invented the new material at Rensselaer's Inventor's Studio, a unique class where students identify specific global environmental and social problems and work independently to create solutions.

The pair applied for patent protection on their invention and started their company, ecovative design, in 2007. It will ship 100,000 units of *EcoCradle*, out of its Green Island, New York facility in 2010.

EcoCradle can be molded to fit any shape. It is reusable, but also can be home compostable and can be added to the garden as fertilizer, or embedded with grass, flowers, or seeds.

Greensulate, Ecovative's insulation material, is being tested in buildings. It is installed both as an exterior insulation material side by side with conventional foam board and in a stud based wall, where it will be monitored in coming years to measure insulating effectiveness through sensors embedded during construction.

Home-Spun Research into Unique bonding properties

Mr. Bayer, who grew up on a farm in Vermont where he and his father often foraged for wild mushrooms, had noticed as a teenager that mushroom roots bind leaves and wood chips together and wondered if that bonding capability might be put to other uses.

He shared his idea with his classmate, Mr. McIntyre, and the two began to explore the unique bonding properties of the mushroom roots. "When I heard about Eben's idea, I saw the potential," said Mr. McIntyre. "This technology has a wide range of applications. There are tons of opportunities to replace unsustainable materials with natural materials."

They tested different kinds of mushrooms to find those that formed the strongest roots; then tested them with different waste products, growing their material in plastic containers under their beds, where it was dark.

In a matter of days, they found that the tiny mushroom roots grew into a dense mass of intertwining fibers, which give the new material massive structural support.

Rensselaer Professor Burt Swersey, who teaches innovation and entrepreneurship, also saw the potential for the new material and encouraged the pair to patent their ideas and continue development. “Our professor saw the future of the technology and the benefits to having material that was grown and self-assembled. It was his incredible support that really convinced us to move forward,” says Mr. Bayer.

Many potential uses

They found that the unique bonding technique, in effect a radical new kind of glue, offered an innovative way to make rigid and structurally strong composite boards. Unlike other types of insulation, the material maintains its shape and insulation value. Those properties also offered potential for uses that demand structural core integrity, as well as for use as packaging material.

The material should receive a Class 1 fire rating, making it a potently valuable firewall material. It is able to withstand temperatures up to 800 degrees Celsius. “You can hit it with a blowtorch and nothing really happens,” says Mr. Bayer.

A self-assembling material

The road to insulation and packaging material was not always easy. “When working with living organisms, weird things can happen,” Mr. Bayer explains. “Some simply did not grow.”

The two worked on the finer points of the science and now can grow mycelium so it never makes a mushroom, only the tiny fibers that self assemble around a seed husk. “The fantastic part is that the material puts itself together,” he says.

The process begins with a liquid slurry that is poured into a mold where it self-assembles and becomes stiff and white in as little as five days. It is then dried in a low temperature oven, the only energy required during the process. As packaging, the material can be molded to encase a specific shape.

Another advantage to the "low tech biotech" of the new material is that it is inexpensive and can be manufactured almost anywhere. Mr. Bayer envisions setting up modular facilities in every geographic region to take advantage of local seed husks and materials, so that they only have to be shipped a few hundred miles, cutting shipping costs and, again, saving energy.

New material is strong, but biodegradable

The material has two properties that seem contradictory: The structural material will last forever, but the packaging material is biodegradable. "Our material is like a variety of wood," explains Mr. Bayer. "If you build a house out of wood, it is strong and will last for years, but once you put wood or our material in a compost pile or land fill, it will biodegrade in months. "

The reason: the biological products, the seed hulls and mushroom roots begin to decompose in contact with the earth and its myriad of enzymes and organisms.

However, even if the material is soaked, it will go back to its original strength once it dries out. And, though it is comprised of fungi, the material produces no allergens.

From good idea to support and recognition

Mr. Bayer and Mr. McIntyre started Ecovative with nothing more than a good idea to revolutionize the way things are made and a "cradle to cradle" environmental philosophy.

With guidance from Rensselaer's Business School, Mr. Bayer and Mr. McIntyre examined the marketing potential for the new bonding technique. They studied dozens of patents, both in the U.S. and abroad, and found nothing comparable to their invention.

They found that energy sustainability was the big focus. “We are also interested in material sustainability,” says Mr. McIntyre. “Ten percent of fossil fuel based energy goes into materials, so sustainable materials and sustainable energy work together.”

“There has been such a focus in recent years on sustainable energy technologies, like solar and winds,” adds Mr. Bayer “But if we are going to commit to building a sustainable future, then we really need to commit to building this future with sustainable materials, not environmentally damaging synthetics.”

Their work has been recognized and funded by the National Collegiate Inventors and Innovators Alliance, the Environmental Protection Agency, the Department of Agriculture, The National Science Foundation, New York State and, of course, their alma mater, Rensselaer Polytechnic Institute.

They also received 500,000 Euros in September 2008, from the Dutch Postcode Lottery’s Green Challenge held each year in Europe for developing a product with the greatest impact on global CO_2 emissions, where the jury declared that Ecovative “combined creativity and sustainability with true entreprenship.” They also received an inventor’s award from Rensselaer, and have been featured on the Discovery Channel and CNN.com

The privately held company now has an eight-person team and has moved to a 9,000 square foot building.

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