

Q&A with Dr. Cora Leibig, Founder and CEO of Chromatic 3D Materials providing Technology that enables Thermosets and Durable Plastics to be used in the 3D Printing Process



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CEOCFO: Dr. Leibig, what is the concept behind Chromatic 3D Materials?

Dr. Leibig: Chromatic 3D Materials is about 3D printing with materials that are very durable. Unlike approaches where materials are melted and printed, we print with materials that form the plastic while it is being printed.

CEOCFO: Would you explain that?

Dr. Leibig: Some of the most durable plastics in use in conventional manufacturing processes cannot melt. Instead of being melted into shape, their precursors are reacted into the final shapes and designs. We are developing products so that these same durable plastics can be used in 3D printing processes. The plastics are being formed during the printing process.

CEOCFO: Why has it been acceptable to do 3D printing the way it is now or have people embraced a new idea?

Dr. Leibig: I think that 3D printing has advanced a long way in the hands of technology companies who really understand how to design robots and machines. In order to use some of these reactive materials that we are talking about, you have to be able to understand and alter the chemistry of the materials you are using.

I believe the 3D printing industry is coming to a turning point. Up to now, users needed to be educated about how 3D printing could improve design and manufacturing processes. Now that customers are starting to understand the technology, they are demanding improved materials so that the parts they make can meet their standards. They want to be able to 3D print, but they want to 3D print with the materials they have used in their conventional processes.

CEOCFO: Would you give an example of how a product is made now and how the next generation printing would make it in a different way?

Dr. Leibig: Right now, the soles of many shoes, especially high heels, men's dress shoes, or hiking boots, are made by injecting liquid into a mold. As the liquid is injected, a chemical reaction is triggered that causes the liquid to solidify in place. It was not a plastic before it was injected as liquid. We are adapting these same reactive materials to be used in 3D printing processes so that you would be able to print that sole of the shoe rather than use an injection molding process. The resulting shoe sole would have the same comfort and durability as shoe soles today, but the 3D printing process would allow customization of the shoe design. Custom designs can bring a better fit or a tailored fashionable design.

In a conventional process of making a shoe sole, the reactive liquids are used because they have better durability and strength than a meltable plastic. Developing technology to 3D print with these reactive systems is essential to deliver the durability required of many manufactured objects, because melted plastics commonly used in 3D printing today simply

cannot offer the same set of properties demanded by manufactured goods made with the reactive systems. These materials that are reacted in place tend to be the most durable plastics.

CEOFCO: *You have a long background in industrial material and chemistry. What led you to work in this particular area now and what gave you the confidence it could be done?*

Dr. Leibig: What is so exciting about the 3D printing industry is that it is bringing part production way down the value chain and into the hands of designers, finished part producers, and users. It is really disruptive to the supply chain. I was inspired to start Chromatic 3D Materials because I believe this disruption also provides the opportunity to deliver innovative materials to the designers and consumers who desire them.

I have spent my career developing innovative plastics and materials, but the customers who demand the innovations are often several steps down the value chain with a conventional supply chain that depends upon large scale production. As a result, many material innovations are not commercially successful. For example, in the course of my career I have developed sustainable bio based materials. We found many customers downstream who were interested in being able to use and pay for more bio-based and sustainable materials, but because that aggregate demand was not large enough to justify the capital investment in a large facility, some of those novel new materials have never been commercially available to those customers. The way the 3D printing industry is taking shape, we can start bringing these types of materials innovations to the people who want it.

“We are developing the materials that will bring 3D printing to the manufacturing floor... Not only we can look at 3D printing technology for building one-offs and custom designs, but we can also transform the kinds of designs that can be taken to the marketplace.”- Dr. Cora Leibig

CEOFCO: *In which areas do you foresee early adoption?*

Dr. Leibig: The traditional path of 3D printing adoption is that first, people look at how they can make prototypes or speed up their design process by making products that are similar to what they could make in the past. Once users of 3D printers are accustomed to the capability of the technology, next they start to design products that never could have been fabricated with traditional processes. We expect to follow this same adoption path. We are starting to work with customers who have traditionally worked with the types of materials we are working with. These are customers who never had access to 3D printing because the technology could not produce their parts. These customers are usually industrial, such as manufacturers of seals and gaskets for equipment, or manufacturers of industrial wheels and rollers. These parts wear out, and need replacement. Manufacturers might only need to build one or two replacement parts, and it is costly to have to build a mold to in order to make the replacement parts. These manufacturers are ideal early adopters, because we give them the ability to print those replacement parts without building an expensive mold. But long term, our technology will enable some exciting new design features and possibilities for customization. I think the possibilities for shoes in the fashion industry is exciting. Our technology will be important in the medical industry for fabricating patient-specific medical devices or physical therapy equipment. This is where I see it going. The amazing thing with 3D printing is that it is a technology platform that enables so many new product concepts. We need to build the business in a way that we allow the ideas to come in while also building and identifying new markets.

CEOFCO: *Does the same 3D printing equipment in use today work with your solutions or would there be adaptations or new equipment that needs to come on board?*

Dr. Leibig: Today, we use a Hyrel3D printer for our development work. I am very excited about the recent announcement of a launch of a printer from German RepRap. They are advertising a new piece of equipment that could handle our types of materials. Collider is also a 3D printing company launching a printer that can handle our types of materials. Our materials could also be accommodated with a straightforward adaptation of a lot of the printers on the market today.

CEOFCO: *Where are you in the development and commercialization process?*

Dr. Leibig: We will have products on the market in early 2018. We have proven that our materials are printable, and that we know how to design our materials to work with printers that are built to accommodate reactive systems.

CEOFCO: *What has been the reaction of people that know about what you are doing? Are many industries aware and what has been the response?*

Dr. Leibig: We have worked with a design company that specializes in 3D printing. When they saw what we can do, they told us, “This is going to turn everything on its head,” just because of the strength and flexibility of the parts we print. When we show samples at 3D printing shows, people will handle our materials as if they are very fragile, like most printed

parts, until we show that we can actually bend and stretch our materials and they don't break and don't deform. The reaction has been a bright-eyed "wow." This is transformative.

CEOCFO: *What has changed from your original concept? What have you learned as you have started the actual development process?*

Dr. Leibig: When we started, I envisioned that we would have a filament company, where we would make materials that are similar to what is on the 3D printing market today but with some special features. But the more I studied the 3D printing industry, the more it was apparent that there was a very large material gap. If you look at the large materials industry, among plastics, these reactive materials comprise 20% of the industry. I recognized that 3D printing was missing the ability to print with these plastics, and knew that these plastics, as a group, were the most durable plastics. The more we worked on it, the more it became clear that if we adapted the chemistry of this class of materials, a number of problems that filament 3D printers face could also be solved. That is what changed the most in the early stages.

CEOCFO: *Is there much research in this area? Do you know of any competition?*

Dr. Leibig: Carbon 3D has a wonderful platform and a number of materials that are probably similar in properties to what we are doing. Our approach is a different printing approach, so that enables different part designs. This industry is so dynamic. There is something like 400 patents published every year in 3D printing, so it is hard to know exactly who is doing what. As far as I can tell, in the 3D printing industry, there are not many companies with the chemistry capability to develop the materials like we are developing them.

CEOCFO: *Development is always costly. Are you seeking investment, partnership or funding?*

Dr. Leibig: Absolutely. We just won a National Science Foundation grant, which was great. We had to go through a lot of technical due diligence in order to win the grant. I am excited to say that we have already achieved what many of our reviewers thought would be impossible. In terms of fundraising, we are seeking a seed round so that we can get some of these products out to market. With the success of our first product launch, we can start generating cash that will support the ongoing development, and expand faster with further investment.

CEOCFO: *Why pay attention right now to Chromatic 3D Materials?*

Dr. Leibig: The important thing that is happening here is that we are developing the materials that will bring 3D printing to the manufacturing floor. 3D printing will not just be a tool for designers to build 3D models of product concepts. We are talking about being able to 3D print the part that you want, and print a part with the performance that will please your customers. Not only we can look at 3D printing technology for building one-offs and custom designs, but we can also transform the kinds of designs that can be taken to the marketplace.

