

Press Information

Austin, TX, August 14, 2001

Molecular Imprints, Inc. and University of Texas, Austin Team to produce semiconductor and opto-electronic devices faster and cheaper than ever.

A dynamic Austin scientist/entrepreneur has brought together two professors at the University of Texas at Austin to found a startup to produce semiconductor and opto-electronic devices faster and cheaper than ever.

Molecular Imprints, Inc. will rely on cutting-edge technology developed by professors Grant Willson and S.V. Sreenivasan and their students, said technology entrepreneur Dr. Norman Schumaker. Schumaker is chief executive officer of FOReTEL Associates, Ltd., the Austin-based consulting firm that is guiding the enterprise in its early days and has provided initial seed money.

Renee Mallett, UT's associate director for technical licensing and intellectual property, said that in addition to owning equity in the company, The University will also receive royalties from the sale of its products.

Willson holds the Rashid Engineering Regents Chair in UT's department of chemical engineering and is also a professor of chemistry and biochemistry. Sreenivasan is an associate professor in UT's mechanical engineering department. The pair's long-term collaboration has yielded a mechanically-driven process to emboss the tiny silicon chips used in computers and other household products—a process which could replace the methods currently in use.

At present, chips are produced by a technique of pattern replication known as optical lithography. A very pure silicon substrate, or wafer, is first coated with a thin metal film. Next comes a layer of photo-resist, a chemical that is both light-sensitive and acid-resistant. The wafer is then exposed to a pattern of projected light and—in a step somewhat analogous to what occurs in photography—"developed", to leave a reverse pattern of exposed metal, which can be etched with acid. Finally, the photo-resist itself is dissolved away. The resultant three-

dimensional grid defines the structure of the semiconductor device.

But this conventional optical lithography has limitations. To make the ever-smaller, faster chips the industry demands, it's necessary to employ ever-decreasing wavelengths of light. "Now they're approaching wavelengths high-powered enough to damage the materials they're working with," said Sreenivasan. It is also extremely expensive. A state-of-the-art projection printer—the instrument used to project the light design—currently costs upwards of \$20 million. Moreover, the sophisticated laser-based multi-lens equipment generates large operational and maintenance expenses.

Willson's and Sreenivasan's new process produces comparably high-quality semiconductor devices using a molding procedure that operates at low pressures and room temperature. Their process, called "step and flash," requires neither a laser light source nor a complicated lens assembly. It starts with creation of a wafer-sized glass or quartz template that has the desired relief structure engraved on it. An organic liquid called ultraviolet-curable monomer is introduced to fill the gap between the template and a second surface (the mold). The template is then exposed to ultraviolet light, which shines through it, solidifying the liquid beneath into a high-fidelity replica.

"It's expensive and time-consuming to produce the template, but once you have that, you can print many copies quickly and cheaply," said Willson, an authority on optical materials and processes.

Precise alignment is critical to molding the super-small, super-fast circuits, according to Sreenivasan, whose expertise is in precision machinery. "These are very fine structures, and you have to lay them one on top of the other using extreme accuracy," he said. His research team built the first step and flash machines from stripped-down equipment donated by IBM.

The researchers said economics alone will give their process an immediate competitive edge. Step and flash already has the ability to process chips as fast as optical lithography, but much cheaper, they said. Beyond that lies the potential to create yet smaller devices at even higher speeds.

Schumaker, a pioneer in LED, laser and TurboDisc technology, managed the New Materials and Technology Group at AT&T Bell Laboratories in New Jersey between 1968 and

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1984. In 1984 he left to found EMCORE Corporation, today a leading manufacturer of process systems for a wide range of semiconductor products. He stayed with EMCORE as chairman, chief executive officer, and president until the company's initial public offering was finalized in 1996. He "retired" to Austin the following year, and immediately began looking for new startups to sponsor. The city's reputation as a high-tech mecca, with facilities like The University, SEMATECH and a variety of semiconductor operations, played a role in his choice.

Schumaker describes FOReTEL as a consulting, mentoring operation. He works with only one carefully selected client at a time, usually becoming chairman and chief executive officer temporarily, until the new company is up and running. For Molecular Imprints, Inc., that could mean three years or more.

"It takes at least three to five years to get things rolling," he said. He expects to hire 20 or 30 people as technology staff—most of them engineers—within the next couple of years. The company will also acquire its own research and development facility.

He called Molecular Imprints, Inc. a particularly interesting and exciting opportunity.

"I'm one of the few people in the United States who will talk to equipment entrepreneurs," he said. "Equipment is not a very popular investment opportunity; since most investors are looking for more rapid returns. But I've focused my career almost exclusively on semiconductors and the equipment necessary to succeed in a competitive industry. Process equipment is the enabling technology for the whole sector. Without the necessary tools, the industry cannot prosper."

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