

Nano World: Nanotools face challenges

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The market for the instruments and tools needed to work on the nanoscale faces substantial challenges in the future, experts told UPI's Nano World.

Atomic-force microscopes, or AFMs, and other tools that experiment on carbon nanotubes and other areas outside the semiconductor industry "are the things that make nanotechnology possible to begin with," said Nathan Tinker, co-founder and executive vice president of the NanoBusiness Alliance in New York City. "They represent the state of the art, and the ability for nanotechnology to drive forward institutionally across industrial sectors." Nanotech analysis group Lux Research, also in New York, has estimated the global impact of nanotech-enabled goods at \$2.6 trillion by 2015. The instruments and tools needed to work on the nanoscale should -- even excluding the semiconductor industry -- form a \$700 million market by 2008, said Tinker, who has drafted a report on nanotools for Business Communications Company in Norwalk, Conn.

"The potential markets out there for nanotechnology tools in terms of aerospace, automobile and other large-scale manufacturing are enormous," he added.

"You could also see a lot of applications in the life sciences and others areas for technology originally developed for the semiconductor industry," said Lawrence Gasman, principal analyst for NanoMarkets, an industry research firm in Sterling, Va.

Still, the costs for ramping up the mostly research-oriented tools used to work on the nanoscale to large-scale production processes are going to be substantial, Tinker said. Moreover, this ramping up is only a fraction of the challenge ahead.

"The big problem seems to me in getting these machines to the point of reliability needed at an industrial scale," he said. "In the semiconductor industry, for example, the largest machines on the assembly line are not the manufacturing machines, but those involved in testing and retesting and calibrating processes that follow, which take so much time and effort. With nanomaterials, at the moment, there are no real standards for any of these processes that would make them cheaper, faster and more efficient."

There needs to be "a very serious conversation on standards" with the American National Standards Institute, the non-profit organization that administers and coordinates the U.S. voluntary standards system, Tinker added. "There hasn't been a concerted effort across industry to move that along with any speed or efficiency. There has to be something like SEMI (the global semiconductor trade association), an industry-wide collaboration that puts out the cash, time and effort to do the testing and have standards in place."

A sticking point among nanotools is the messy state of intellectual-property rights in the field. "There are lots of overlapping claims," Tinker said. For instance, nanotool-making companies Veeco, in Woodbury, N.Y., and Asylum Research in Santa Barbara, Calif., are suing each other over patent infringement.

"You're going to see more and more litigation taking place in the tools space, especially if we start seeing major growth with the markets and major uptake by industrial stage users," Tinker said, "but a significant amount of intellectual property out there is owned by the government,

being done at national labs and so forth, that's basically free to use by any citizen of the United States. That's been under-utilized by industry, and could be extremely useful to a wide range of areas."

Another major roadblock for nanotechnology tools "is the lack of ability to quickly, efficiently and thoroughly characterize nanoparticles," Tinker said. "The characterization process is very tough. It requires the incredibly minute ability to measure and analyze a particle or surface, and it is absolutely essential to have that characterization correct if you want to start integrating nanoparticles and nanomaterials into other devices."

Tinker noted there are plans for at least two labs to address this characterization issue. U.S. Steel, Alcoa, Bayer Material Science and PPG Industries -- industry leaders in steel, aluminum, polymers and coatings, respectively, with ongoing nanotech research projects of their own -- are helping establish the Pennsylvania NanoMaterials Commercialization Center. The center, to be located in southwestern Pennsylvania, will operate in cooperation with three area universities: Carnegie Mellon, the University of Pittsburgh and Penn State. The center's likely focus will be on characterization, Tinker said. A report by the Battelle Memorial Institute in Columbus, Ohio, for the Connecticut Office for Workforce Competitiveness has suggested Connecticut establish a Nanotechnology Characterization Facility to serve universities and industry across the state.

"Neither of these are even in the blueprint stage at this point, but it's clear that characterization is important, given at least two instances of labs specifically built to address it," Tinker said.

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