OSU's Transparent Electronics Key to Solar Energy Breakthrough

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Transparent transistors and optoelectronics created by researchers at Oregon State University and HP have found their first key industrial application in a new type of solar energy system that its developers say will be four times more cost-efficient than any existing technology.

Xtreme Energetics, Inc., of Livermore, Calif., announced they will use the OSU inventions, on which HP holds the exclusive licensing rights, in technology they believe will convert sunlight to electricity at twice the efficiency and half the cost of traditional solar panels.

OSU and Xtreme Energetics are pursuing continued collaborative research on this solar technology. HP has funded some of OSU's research in advanced materials, collaborated with the university to invent transparent transistor technology, and is now making this technology available worldwide through its intellectual property licensing group.

Although this is one of the first applied uses of transparent electronics, it had not even been envisioned when OSU researchers in recent years developed the world's first completely transparent integrated circuit from inorganic compounds.

"After the first discoveries with transparent electronics, we were thinking of applications like transparent displays or consumer electronics," said John Wager, a professor of electrical and computer engineering at OSU. "But as with any breakthrough, sometimes at first you can't even see all the possible uses. The potential to create solar

energy technology that's far more efficient and affordable is very exciting."

Wager said that the concepts being developed by Xtreme Energetics should be an excellent fit with the capabilities of transparent electronics and integrated circuits.

"The approach being used by Xtreme Energetics is innovative, it involves a very new way to optimize solar energy collection," Wager said. "Clearly there will be some challenges we will have to work through, but there do not appear to be any major problems. We're all optimistic that this system is going to work. And there are still many other potential applications of transparent electronics as well."

Most advanced solar energy systems use mechanical means to track the sun and optimize the concentration of energy. The system developed by Xtreme Energetics - which the use of transparent electronics will facilitate - has an optical approach to tracking and focusing the light. By eliminating mechanical tracking and using a flat design that could be implemented either on rooftop panels or central utilities, company officials say they can achieve an "ultra-high" level of solar energy efficiency that will be far more cost-competitive with other energy forms.

OSU announced just two years ago that it had created the world's first transparent integrated circuit, based on fundamental materials science research in the College of Engineering and the College of Science at the university. The work is also affiliated with the Oregon Nanoscience and Microtechnologies Institute, an Oregon-based collaboration of universities, private industries and the state.

The work has moved rapidly from fundamental development of new compounds – amorphous oxide semiconductors – to applied uses, in part

because researchers were quick to cast aside approaches that might have been scientifically interesting but impractical for real use.

“We didn’t even try to work with some metals such as gold and silver which are too expensive, or others such as mercury or lead that might have environmental concerns,” Wager said. “We knew all along it would be important to create transparent electronic materials that were stable, environmentally friendly, and able to be manufactured at reasonable costs. We wanted systems that would work, not just be laboratory curiosities.”

According to OSU researchers, some of the research that could bring transparent integrated circuits into applied use may be accomplished in a period of a few years, OSU researchers said, compared to decades in the evolution of conventional electronics. Licensing to HP of the exclusive rights to develop and market products based on this technology has also helped the inventions move ahead quickly. HP officials have said they envision applications in the display, printing, medical and automotive industries – not to mention solar energy.

New industries, employment opportunities, and more effective or less costly consumer products are all possible as the era of transparent electronics evolves, OSU researchers say.

OSU scientists also just published the first-ever book in this field, titled “Transparent Electronics,” through Springer Science and Business Media.

Source: Oregon State University