Scientists Discover Way To Order Polar Molecules In Crystals

Researchers at the University of Missouri-Columbia have found a way to organize molecules in a crystal so that the poles align in the same direction. In preliminary tests, the scientists also have discovered that aligned crystals hold potential to change the frequency of light, making them important to the future of telecommunications and computing.

"Making crystals parallel is difficult to do, but we've found a way to do it and are getting better at it," said Rainer Glaser, professor of chemistry in MU's College of Arts and Science. "Our preliminary testing indicates that there is a synergism we didn't expect. As a chemist, I was expecting the potential of a parallel crystal to be the sum of all its molecules, but in our collaborative work, we've found that there is even greater potential for these crystals than I anticipated."

Glaser has collaborated with Yongqiang Sui, a doctoral student in chemistry, and Ping Yu, MU assistant professor of physics, in this interdisciplinary effort. As a physicist, Yu has been able to look at the crystals in new ways and consider different applications for them. He has found that when an infrared laser is focused at a parallel crystal, the frequency of light changes. This finding, still in the preliminary stages, could have the potential to lead to technology that would create faster and more efficient microchips.

"If you have a laptop computer sitting on your knees, you'll feel heat from it, but with this technology, the computer would not get hot," Sui said. "Large computing facilities spend millions of dollars in energy bills every year to keep their computers cool. Technology using crystals would not only reduce those costs, but also create faster computers. We hope that our discoveries might play a role in the development of this technology."

Glaser said the team's next step is to test different types of crystals to determine what has the best potential.

A study detailing the discovery of how to achieve polar order will be published in the January 2007 issue of the journal Accounts of Chemical Research, which also will feature a cover graphic illustrating the potential of these crystals to alter light frequency. Glaser, Yu and Sui and co-investigators Nathan Knotts, Linghui Li, Meera Chandrasekhar, Christopher Martin and Charles L. Barnes presented a paper on this topic earlier this year at the international conference "Dalton Discussion 9: Functional Molecular Assemblies," and this paper has been published in a special issue of the journal "Dalton Transaction." - University of Missouri-Columbia

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