

New Research Lights the Way to Super-Fast Computers

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New research published today in the journal *Nature Communications*, has demonstrated how glass can be manipulated to create a material that will allow computers to transfer information using light. This development could significantly increase computer processing speeds and power in the future.

The research by the University of Surrey, in collaboration with the University of Cambridge and the University of Southampton, has found it is possible to change the electronic properties of amorphous chalcogenides, a glass material integral to data technologies such as CDs and DVDs. By using a technique called ion doping, the team of researchers have discovered a material that could use light to bring together different computing functions into one component, leading to all-optical systems.

Computers currently use electrons to transfer information and process applications. On the other hand, data sources such as the internet rely on optical systems; the transfer of information using light. Optical fibres are used to send information around the world at the speed of light, but these signals then have to be converted to electrical signals once they reach a computer, causing a significant slowdown in processing.

"The challenge is to find a single material that can effectively use and control light to carry information around a computer. Much like how the web uses light to deliver information, we want to use light to both deliver and process computer data," said project leader, Dr Richard Curry of the University of Surrey.

"This has eluded researchers for decades, but now we have now shown how a widely used glass can be manipulated to conduct negative electrons, as well as positive charges, creating what are known as 'pn-junction' devices. This should enable the material to act as a light source, a light guide and a light detector – something that can carry and interpret optical information. In doing so, this could transform the computers of tomorrow, allowing them to effectively process information at much faster speeds."

The researchers expect that the results of this research will be integrated into computers within ten years. In the short term, the glass is already being developed and used in next-generation computer memory technology known as CRAM, which may ultimately be integrated with the advances reported.

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