Single chip integrates transistors and photonic components

Each new year brings with it new cell phones and computers that out perform their predecessors. The regular and continuing improvement in computing power is one of the great successes of modern engineering; however, as consumers become more dependent on their devices, they increasingly demand better battery life. Now scientists may have created one possible solution to this problem by incorporating next-generation photonic materials into traditional circuits, promising computers that are capable of running more calculations on less energy.

In a recent issue of *Nature* (DOI:10.1038/nature16454), Chen Sun and Yunsep Lee of the University of California–Berkeley, Mark T. Wade of the University of Colorado Boulder, Jason S. Orcutt of the Massachusetts Institute of Technology, and their colleagues describe a "zero-change" method to incorporate photonic device structures into the existing microelectronics design framework. Photonic components can quickly and efficiently convey information using less power, but they have been difficult to adapt to conventional microelectronics fabrication processes. This is because the electronic and photonic structures are generally fabricated separately and then connected in multiple, cumbersome steps.

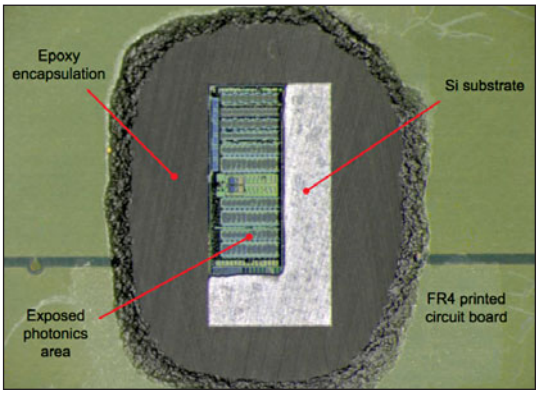

Image of the integrated electronic–photonic processor design. Credit: *Nature*.

The method proposed by Sun and colleagues incorporates SiGe and traditional Si using conventional, silicon-on-insulator, complementary metal oxide semiconductor processing. This approach represents a significant advantage, since companies could potentially save billions of dollars by using existing processing lines. The researchers demonstrated their method by fabricating a chip consisting of microprocessor and memory modules connected by a photonic waveguide, where this module is stable under a range of operating conditions. The group argues that their approach can be expanded to more complex designs, paving the way for a broad spectrum of electronic–photonic processors. □

Steven Spurgeon

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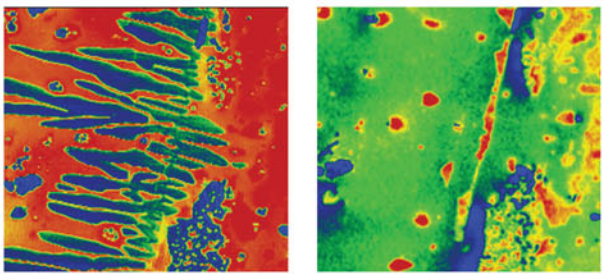

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