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## Graphene-Silicon Hybrid Photonic Chips.

## Monday, July 16, 2012

"And now, the recent excellent work done by this group of Columbia researchers demonstrates that graphene is also unique electro-optical material for ultrafast nonlinear optical modulation when it is combined with silicon photonic crystal structures. This opens an important doorway for many novel optoelectronic device applications, such as ultrafast chip-scale high-speed optical communications."

Another week, and another graphene announcement that "opens an important doorway for many novel optoelectronic device applications, such as ultrafast chip-scale high-speed optical communications." This blog is getting spoiled for choice of announcements, and I am only following those that come out in English. Below, the latest use of graphene in developing photonic integrated circuits. Where it all leads it's still too early to say, but one thing is certain, the graphite/graphene age is rolling out far faster than any other great technology advance in mankind's history.

Somewhat surprisingly, no one has yet to my knowledge, put together an early stage investment vehicle to invest in graphite/graphene diversifying the risk. Can the age of the graphene hedge fund be long delayed?

## Unique Properties of Graphene Lead to a New Paradigm for Low-Power Telecommunications

ScienceDaily (July 15, 2012) — New research by Columbia Engineering demonstrates remarkable optical nonlinear behavior of graphene that may lead to broad applications in optical interconnects and low-power photonic integrated circuits. With the placement of a sheet of graphene just one-carbon-atom-thick, the researchers transformed the originally passive device into an active one that generated microwave photonic signals and performed parametric wavelength conversion at telecommunication wavelengths.



----- "Showing the power-efficiency of this graphene-silicon hybrid photonic chip is an important step forward in building all-optical processing elements that are essential to faster, more efficient, modern telecommunications. And it was really exciting to explore the 'magic' of graphene's amazingly conductive properties and see how graphene can boost optical nonlinearity, a property required for the digital on/off two-state switching and memory."

----- The team of researchers from Columbia Engineering and the Institute of Microelectronics in Singapore are working together to investigate optical physics, material science, and device physics to develop next-generation optoelectronic elements.

They have engineered a graphene-silicon device whose optical nonlinearity enables the system parameters (such as transmittance and wavelength conversion) to change with the input power level. The researchers also were able to observe that, by optically driving the electronic and thermal response in the silicon chip, they could generate a radio frequency carrier on top of the transmitted laser beam and control its modulation with the laser intensity and color. Using different optical frequencies to tune the radio frequency, they found that the graphene-silicon hybrid chip achieved radio frequency generation with a resonant quality factor more than 50 times lower

than what other scientists have achieved in silicon. <u>More</u>

## Regenerative oscillation and four-wave mixing in graphene optoelectronics

Nature Photonics (2012) doi:10.1038/nphoton.2012.147 Received 06 February 2012 Accepted 23 May 2012 Published online 15 July 2012 <u>Link</u>

**Institute of Microelectronics , Singapore.** Link.

Posted by Graeme Irvine at 05:36:36 AM in Editor, Graeme Irvine, Intel

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