Graphene-based optical modulators poised to break speed limits in digital communications

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In yet another astounding application of the "wonder material" graphene, scientists at the University of California, Berkeley discovered that it makes an excellent active media for optical modulators. Graphene-based modulators are expected to significantly enhance ultrafast optical communication and computing. team will report on their findings at the Optical Fiber Communication Conference and Exhibition/National Fiber Optic Engineers Conference (OFC/NFOEC) taking place next week in Los Angeles.

Modulators play a vital role in communications due to their switching ability, because this is what controls the speed that data packets can travel through networks. As the speed of data pulses sent out increases, it means that greater volumes of information can be transmitted.

"We demonstrated a graphene-based optical modulator with a broad optical bandwidth (1.35-1.6 μm), a small device footprint (25 μm2), and high operational speed (1.2 GHz at 3dB) under ambient conditions—all of which are essential for optical interconnects for future integrated optoelectronic systems," says Ming Liu, a post-doctoral researcher working at UC Berkeley's NSF Nanoscale Science and Engineering Center. "The modulation efficiency of a single layer of a hexagonal carbon atom is already comparable to, if not better than, traditional semiconductor materials, which are orders of magnitude larger in active volume."

Looking into future applications, graphene-based modulators could be

very compact and potentially perform at speeds up to 10 times faster than today's technology allows. They may someday enable consumers to stream full-length, high-definition, 3-D movies onto their smartphones within mere seconds.

More information: Liu's talk, "Graphene-based optical modulators," takes place Tuesday, March 6 at 3:30 p.m. in the Los Angeles Convention Center.

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