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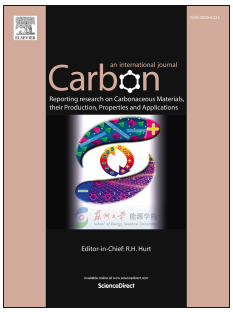

Room-temperature photoconduction assisted by hot-carriers in graphene for sub-terahertz detection

Changlong Liu, Lin Wang, Xiaoshuang Chen, Jing Zhou, Weida Hu, Xinran Wang, Jinhua Li, Zhiming Huang, Wei Zhou, Weiwei Tang, Gangyi Xu, Shao-Wei Wang, Wei Lu

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Graphical Abstract: In this article, we investigate the origins of the photocurrent response in a biased homogeneous graphene device coupled with a log-periodic antenna at room temperature. In such a simple configuration, the photocurrent generation follows neither the plasma wave rectification nor the bolometric mechanism, whilst hot-carrier assisted photoconduction dominates even when the photon energy is far below the inter-band threshold. When the electromagnetic radiation is absorbed by the free carriers in graphene, injection of electrons from the electrode depletes or the sheet density increases, due to the fast electron-hole recombination or generation driven by hot carrier effect. The extra generated carriers in combination with a trap-free interface enable significant photoconductive gain of ~10^4 and high electrical bandwidth of ~10^6 Hz (response time ~1 μs).

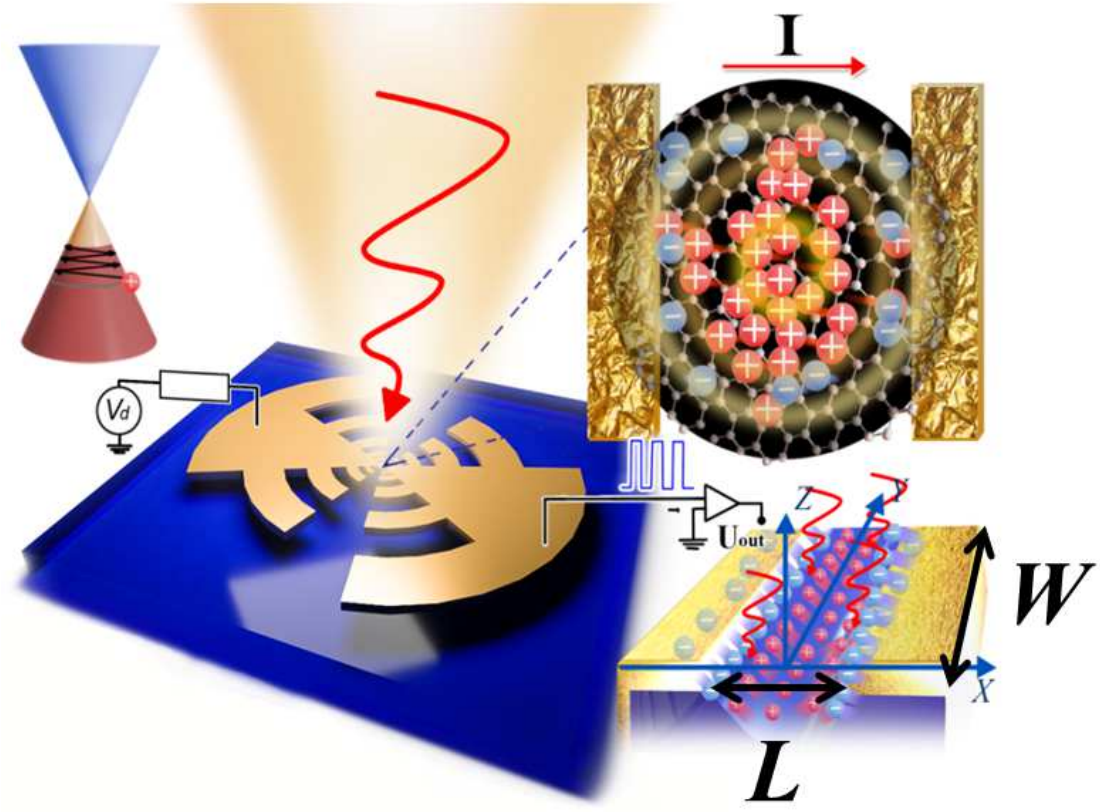

Figure 1. Schematics of the antenna integrated graphene-photoconductor and its photon-detection principle: the hot carrier assisted photoconductive effect.