Electromagnetic wave-induced photoelectric effect for sensitive THz detection

With the support by the National Natural Science Foundation of China and the Ministry of Science and Technology of China, the research team led by Prof. Huang Zhiming(**黄志明**) and Academician Chu Junhao (**褚君浩**) at the National Laboratory for Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences, reported recently on the extreme sensitivity of room-temperature photoelectric effect for terahertz detection, which was published in *Advanced Materials* (2016, 28: 112—117).

Terahertz (THz) is a cutting-edge technology and believed to change our future life. Although it has been proposed to fill the THz gap over ten years, there is still no good solution for THz detection until now. Diverse potential THz applications have been demonstrated alreadyin medicine, biology, security, space, communication, and basic science research. They still need to improve the performance of THz detection for real applications. Nevertheless, it confronts a critical challenge because the frequencies are too high for conventional electronics and the photon energies are too small for classical optics. Proposing a unique theory for suitable terahertz detection, the team reported that a hypersensitive THz photoconductivity was achievedin the metal/semiconductor structure with narrow-gap semiconductor of Hg_{1-x} Cd_x Te materials by the wave nature of photons for high performance of room-temperature THz detection. It stems from the transfer of the electrons in the metal into the electromagnetic induced well (EIW) in the semiconductor formed by the anti-symmetrical electric field of the radiated terahertz wave. They demonstrated the THz photodetector with extremely low noise equivalent power, high detectivity, large size, rapid response and high cutoff frequency at room temperature. Their results show great prospective to open avenue in the immature terahertz detection and make THz detection become easy.

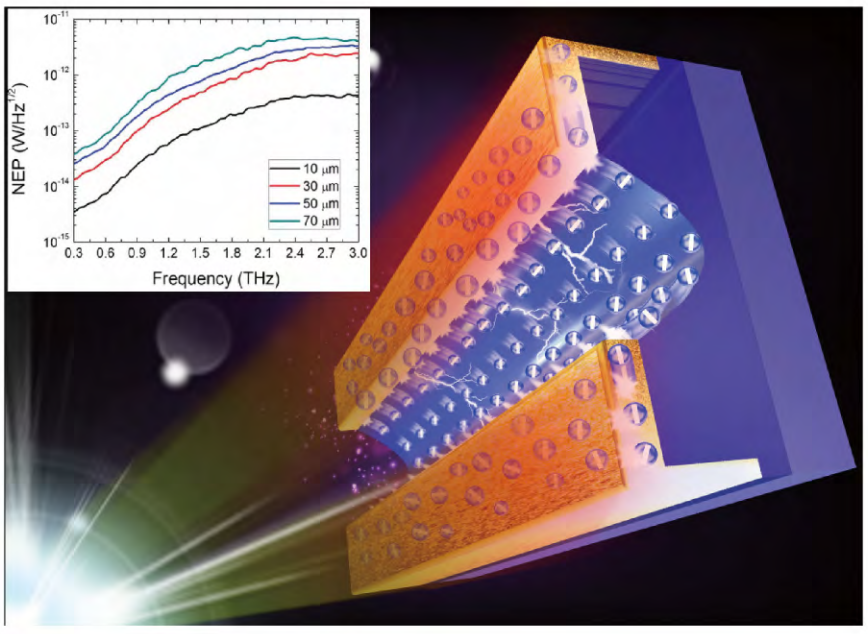

Figure Electromagnetic wave-induced photoelectric effect for THz detection.