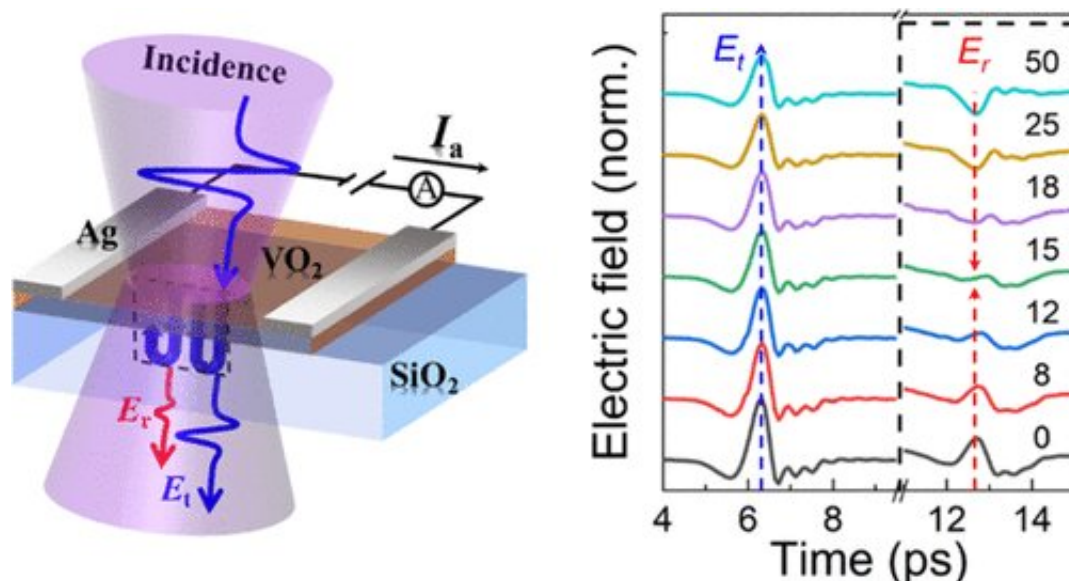


Scientists develop smart terahertz electro-optic modulator

July 7 2022, by Zhang Nannan



Graphical abstract. Credit: *ACS Applied Materials & Interfaces* (2022). DOI: 10.1021/acsami.2c04736

A research group led by Prof. Sheng Zhigao from the Hefei Institutes of Physical Science (HFIPS) of the Chinese Academy of Sciences (CAS) developed an active and smart Terahertz (THz) electro-optic modulator. Their results were published in *ACS Applied Materials & Interfaces*.

Terahertz technology has attracted extensive attention in recent years due to its wide applications in imaging, communication, medicine and security. These applications drive the urgent need for high-performance

THz devices. Active and smart THz modulators are an urgent requirement for intelligent THz beam scanning and automatic [terahertz](#) imaging.

In this study, the researchers proposed this active and smart THz electro-optic [modulator](#) based on vanadium dioxide (VO_2) film. In addition to transmission and absorption, it can also electrically modulate the reflection and phase of THz waves.

By using an electric-current-induced insulator-to-metal transition in the VO_2 film, the researchers achieved near-perfect antireflection (99.9% modulation depth) and 180° phase switching. Smart electro-optic THz control was realized in the VO_2 structure by using a "THz-electro-THz" geometry feedback loop.

The desired THz amplitude could be achieved accurately no matter what the initial condition was and how the [external environment](#) changed.

This proposed electro-optic THz modulation method, using strongly correlated electron material, has opened up avenues for the realization of THz smart devices.

More information: Zhuang Ren et al, Active and Smart Terahertz Electro-Optic Modulator Based on VO_2 Structure, *ACS Applied Materials & Interfaces* (2022). [DOI: 10.1021/acsami.2c04736](https://doi.org/10.1021/acsami.2c04736)

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