PRESS RELEASE

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Subject line: High photosensitivity 2D-few-layered molybdenum diselenide phototransistors

Researchers at Toyohashi University of Technology, Japan have fabricated High photosensitivity back-gated field-effect phototransistors made of only 20 nanometer thick molybdenum diselenide (MoSe2) crystals by facile mechanical cleavage and transfer of MoSe2 flakes onto a silicon wafer for next generation photodetector applications.

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Two-dimensional (2D) layered materials are now attracting a lot of interest due to their unique optoelectronic properties at atomic thicknesses. Among them, graphene has been mostly investigated, but the zero-gap nature of graphene limits its practical applications. Therefore, 2D layered materials with intrinsic band gaps such as MoS2, MoSe2, and MoTe2 are of interest as promising candidates for ultrathin and high-performance optoelectronic devices.

Here, Pil Ju Ko and colleagues at Toyohashi University of Technology, Japan have fabricated back-gated field-effect phototransistors made of MoSe2 crystals having a thickness of only twenty nanometers. The devices were fabricated by mechanical cleavage of MoSe2 crystals into few-layered flakes, followed by transfer onto a silicon wafer with pre-deposited titanium electrodes.

Despite their ultra-thin physical size, the devices showed excellent field-effect phototransistor characteristics. The measured photoresponsivity of 97.1 AW-1 at zero back gate voltage was higher than previous reports of photodetectors fabricated using GaS, GaSe, MoS2, and InSe. The photoresponse of the MoSe2 was much faster (less than 15 msec) than ultrasensitive photodetectors based on monolayer MoS2. Furthermore, the theoretical external quantum efficiency was 280-fold higher than of commercial Si and InGaAs photodiodes.

The research shows that MoSe2 is a promising material for photodetector applications. The group is optimization the device performance by studying thickness-dependent of the photosensitivity.

Reference:
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Founded in 1976 as a National University of Japan, Toyohashi University of Technology is a vibrant modern institute with research activities reflecting the modern era of advanced electronics, engineering, and life sciences.
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