Scientists create black arsenic visible infrared photodetectors

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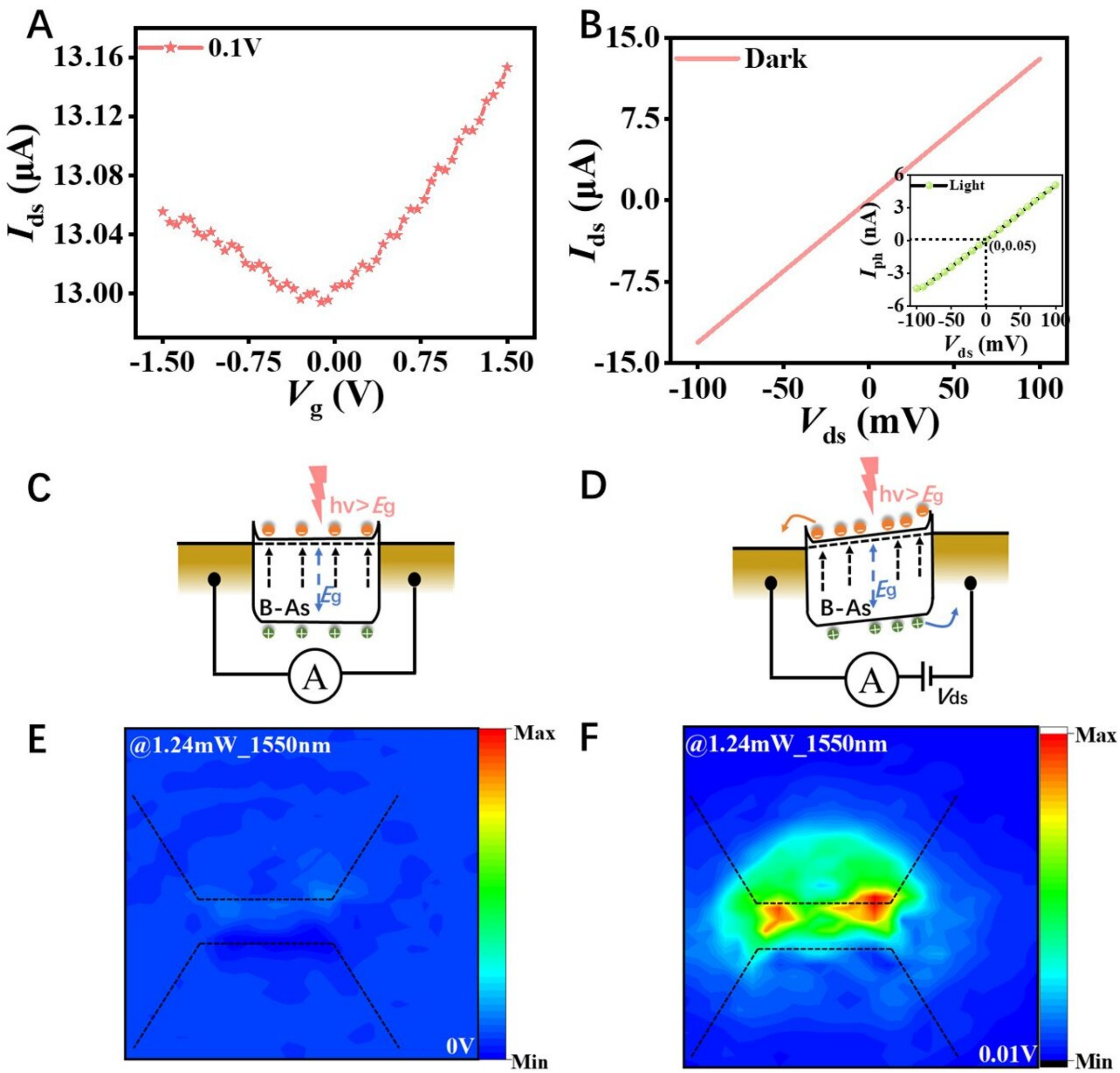

As shown in Fig A-B, at room temperature, the team discovered through the device's transfer characteristics and voltage-current characteristics that the prepared device is an n-type depletion-mode FET and exhibits good Ohmic contact. The physical mechanism of the B-As detector device, including the visible light and near-infrared bands, is described as shown in Fig C-D. As seen in Fig E-F, a weak photocurrent signal is emitted from the device at 0 V bias, confirming our previous explanation. Increasing the bias voltage by 0.01V at the same position of the channel reveals a significant expansion of the photosensitive area. Credit: Advanced Devices & Instrumentation

In recent years, the exceptional structure and fascinating electrical and optical properties of two-dimensional (2D) layered crystals have attracted widespread attention. Examples of such crystals include graphene, black phosphorus (BP), and transition metal dichalcogenides (TMDs).

With their atomic thickness, high carrier mobility, and tunable bandgaps, these materials hold immense promise in various applications and continue to garner significant interest in the scientific community. Graphene, a crystalline structure of tightly packed carbon atoms connected by sp^2 hybridization forming a single-layer two-dimensional honeycomb lattice, boasts an electron mobility as high as 2×10^5 $cm^2\cdot V^{-1}\cdot s^{-1}$.

However, graphene's short-lived photo-generated carriers attributed to its zero bandgap and extremely low light absorption (2.3%) hinder its device applications. Transition metal dichalcogenides feature wide bandgaps and relatively lower carrier mobility (