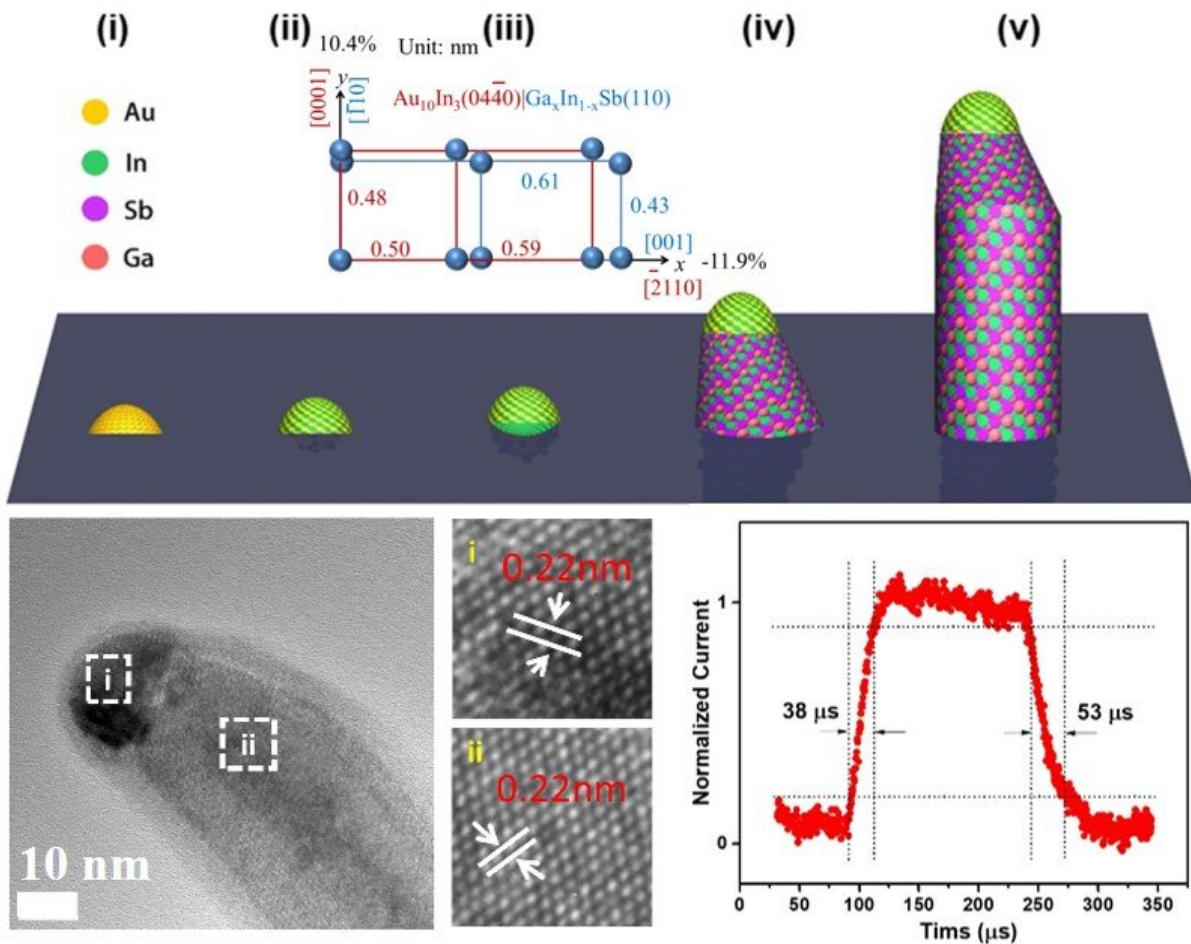


Scientists synthesize new nanowires to improve high-speed communication

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The growth mechanism and fast 1550 nm IR detection of the single-crystalline $\text{In}_{0.28}\text{Ga}_{0.72}\text{Sb}$ ternary nanowires Credit: HAN Ning

Chinese scientists have synthesized new nanowires with high carrier mobility and fast infrared light (IR) response, which could help in high-speed communication. Their findings were published in *Nature Communications* on April 10th.

Effective optical communications requires 1550 nm IR, which is received and converted into an [electrical signal](#) for computer processing. Fast light-to-electrical conversion is thus essential for high-speed communications. According to [quantum theory](#), 1550 nm IR has energy of ~ 0.8 eV, and can only be detected by semiconductors with bandgaps lower than 0.8 eV, such as germanium (0.66 eV) and III-V compound materials such as $\text{In}_x\text{Ga}_{1-x}\text{As}$ (0.35-1.42 eV) and $\text{In}_x\text{Ga}_{1-x}\text{Sb}$ (0.17-0.73 eV). However, those materials usually have huge crystal defects, which cause substantial degradation of photoresponse performance.

Scientists from the Institute of Process Engineering (IPE) of the Chinese Academy of Sciences, City University of Hong Kong (CityU) and their collaborators synthesized highly crystalline ternary $\text{In}_{0.28}\text{Ga}_{0.72}\text{Sb}$ nanowires to demonstrate high carrier mobility and fast IR response.

In this study, the $\text{In}_{0.28}\text{Ga}_{0.72}\text{Sb}$ nanowires (bandgap 0.69 eV) showed a high responsivity of 6000 A/W to IR with high response and decay times of 0.038ms and 0.053ms, respectively, which are some of the best times so far. The fast IR response speed can be attributed to the minimized crystal defects, as also illustrated by a high hole mobility of up to 200 cm^2/Vs , according to Prof. Johnny C. Ho from CityU.

The minimized crystal defect is achieved by a "[catalyst](#) epitaxy technology" first established by Ho's group. Briefly, the III-V compound nanowires are catalytically grown by a metal catalyst such as gold, nickel, etc.

"These catalyst nanoparticles play a key role in nanowire growth as the [nanowires](#) are synthesized layer by layer with the atoms well aligned with those in the catalyst," said HAN Ning, a professor at IPE and senior author of the paper.

More information: Dapan Li et al. Ultra-fast photodetectors based on high-mobility indium gallium antimonide nanowires, *Nature Communications* (2019). [DOI: 10.1038/s41467-019-09606-y](https://doi.org/10.1038/s41467-019-09606-y)

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