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Fast Photo-detection in Phototransistors based on Group III-VI Layered Materials. PRASANNA PATIL, SUJOY GHOSH, MILINDA WASALA, Southern Illinois University Carbondale, SIDONG LEI, ROBERT VA-JTAI, PULICKEL AJAYAN, Rice University, SAIKAT TALAPATRA, Southern Illinois University Carbondale — Response time of a photo detector is one of the crucial aspect of photo-detection. Recently it has been shown that direct band gap of few layered group III-VI materials helps in increased absorption of light thereby enhancing the photo responsive properties of these materials. Ternary system of Copper Indium Selenide has been extensively used in optoelectronics industry and it is expected that 2D layered structure of Copper Indium Selenide will be a key component of future optoelectronics devices based on 2D materials. Here we report fast photo detection in few layers of Copper Indium Selenide ($\text{CuIn}_7\text{Se}_{11}$) phototransistor. Few-layers of $\text{CuIn}_7\text{Se}_{11}$ flakes were exfoliated from crystals grown using chemical vapor transport technique. Our photo response characterization indicates responsivity of 10^4 mA/W with external quantum efficiency exceeding 10^3 . We have found response time of few μs which is one of the fastest response among photodetectors based on 2D materials. We also found specific detectivity of $\sim 10^{12}$ Jones which is an order higher than conventional photodetectors. A comparison between response times of various layered group III-VI materials will be presented and discussed. This work is supported by the U.S. Army Research Office through a MURI grant # W911NF-11-1-0362.

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