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Fast Response Optœlectronics Devices

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Different types of optoelectronics devices [1].

Optoelectronics devices are components based on the interaction of light-within different spectral region- with electronics devise. Laser diodes, light emitting diodes LEDs, photodetectors, image sensor, electro optic modulators, opto isolators, phototubes, image intensifiers and photonics integrated circuits are examples of optoelectronics devices. However, these devices are widely used in different applications such as laser technology, optical fiber communications and optical metrology; and the rapid developments in these applications has promoted a demand for high speed or fast response components. For some, the fast response means fast response in communication networks. For others, it refers to high speed imaging which leads the scientists to develop high speed camera with low light and ultra-fast capture without blur. Nevertheless, fast response for many researchers means generating laser light in the attosecond regime, which was easily achieved by [2] and the best is yet to come. Most common way to improve the performance of optoelectronics devices is by using suitable and efficient materials for fabricating these devices. The optoelectronics devices are mainly based on semiconductors materials. However, 2D materials showed an outstanding optical characteristic and performance for fabricating photovoltaic cells, optical fibers, quantum computing, sensing and security [3]. Besides, the 2D materials addressed some challenges for example obtaining high efficiency and speed, lower power consumption and carbon foot print. Recent developments in 2D materials in combining these materials with other structures, yield new tunable ban structure and ultra-high nonlinear coefficiency, ultra-fast carrier mobility. As a consequence, these 2D materials such as black phosphorous BP, graphene and Transition Metal Dihalcogenides TMDs were efficiently utilized in

bio-sensing, laser sources, optical communication and photodetector applications [4]. As results, the 2D materials are considered a promising candidates for fabricating an ultra-fast optoelectronics component.

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