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Nanocarbon-based light emitters for integrated optoelectronics and optical communications

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NIR light emitters are widely used in the areas of optical communication, spectroscopy, etc. However, the light emitters based on compound semiconductors face significant challenges with respect to their integration with silicon-based platforms because of their large footprints and low crystallinity grown on Si substrates. On the other hand, carbon nanomaterials, such as carbon nanotubes (CNTs) and graphene, are an attractive material for light emitters because (i) a small footprint emitter can easily be obtained due to its simple fabrication process, (ii) carbon nanomaterials can be prepared directly on a Si wafer, (iii) the unique optical, electrical and thermal properties are exhibited due to their low-dimensional structures. Here we talk about the electrically driven, ultra-high-speed light emitter based on carbon nanotubes and graphene [1-3].

We also talk about the quantum light generation from an individual single-walled CNT (SWNT). Photon antibunching is a typical feature of low dimensional materials, such as semiconductor quantum dots, and have been attracted much attention for use as single-photon sources in quantum cryptography. However, single photon sources at room temperature and telecommunication wavelength has not been reported so far. In this study, we demonstrated the photon antibunching in SWNT at telecommunication wavelength and room temperature [4].

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