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Origins and Applications of the Optical Properties of Graphene Derivatives ANTON NAUMOV, MD. TANVIR HASAN, ELIZABETH SIZEMORE, CONOR RYAN, THOMAS PAZ, Texas Christian University — Due to its remarkable properties, graphene has become a basis of many novel microelectronic devices. However its functional derivatives including graphene oxide (GO) can be mass-produced at lower costs and retain many properties of graphene in addition being water soluble. GO also exhibits fluorescence in the visible/near-IR suitable for applications in optoelectronics and biomedicine. We aim to explain optical properties of GO and other novel graphene derivatives produced in our work as a result of confinement of graphitic domains by functional groups. Functionalization-induced changes in emission signatures of GO together with appearance of fluorescence after nitration or bromination of initially non-emissive reduced graphene oxide support this confinement-induced band gap model. Additionally we show that optical properties of GO can be utilized for in-vitro molecular imaging and pH-sensing in cancer and healthy cells. GO flakes optimized for this application are non-toxic at imaging concentrations and exhibit efficient internalization at 1h post transfection as they are imaged in the cytoplasm. As a result this work elucidates the origins of optical properties of graphene derivatives and explores their applications in nanomedicine.

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