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Red shift in the photoluminescence of colloidal carbon quantum dots induced by photon reabsorption WENXIA ZHANG, JIYANG FAN, Department of Physics, Southeast University, Nanjing 211189, Peoples Republic of China, DEPARTMENT OF PHYSICS, SOUTHEAST UNIVERSITY, NANJING 211189, PEOPLES REPUBLIC OF CHINA TEAM — We synthesize the colloidal carbon/graphene quantum dots 1-9 nm in diameter through a novel alkaline-assisted method and deeply studied their photoluminescence properties. Surprisingly, the luminescence properties of a fixed collection of carbon dots can be systematically changed as the concentration varies. A model based on photon reabsorption is proposed which explains well the experiment. Infrared spectral study indicates that the surfaces of the carbon dots are totally terminated by three bonding-types of oxygen atoms, which result in their ultra-high hydrophilicity. Our result clarifies the mystery of distinct emission colors in carbon dots and indicates that photon reabsorption can strongly affect the luminescence properties of colloidal nanocrystals.This mechanism can be generalized to help understand the complex luminescence properties of other colloidal quantum dots. and should be seriously considered,otherwise, distinct conclusions may be drawn if different concentrations of quantum dots have been utilized in studying their luminescence properies.

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