Mild synthesis of highly luminescent biocompatible carbon dots with ethanolamine and citric acid: Investigating interactions between localized energy states

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Carbon dots (CNDs) have been intensively studied as a fluorescent material because of its high photostability, biocompatibility, and low toxicity. CNDs show outstanding potential in various applications exhibiting unique optical properties, depending on different precursors and preparation methods. However, there is still no comprehensive explanation to demonstrate how experimental factors affect the optical properties of CNDs. In our research, we have investigated the transfer of emission energy state through controlling molar ratio of two different carbon sources: citric acid and ethanolamine. Using these precursors, highly crystalline structures could be obtained at mild temperature, and the effect of the surface states of CNDs on their fluorescence mechanism was revealed through Fourier-transformed infrared spectroscopy and time-resolved photoluminescence. Our CNDs have showed strong photoluminescence in the visible range (420-500 nm), and have been successfully applied to fluorescence cell imaging as a contrast agent.