The Origin of Photoluminescence in Citric Acid-Based Carbon Dots

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Carbon dots are an interesting class of fluorescent materials, often showing bright emission in different wavelengths and even excitation-dependent emission wavelengths. A plethora of organic-based precursors and synthetic procedures have been demonstrated to lead to the formation of carbon dots. However, their optical properties can vary strongly based on these factors, making an understanding of the origin of the optical properties difficult. The use of citric-acid and ethylendiamine as precursors has produced some of the most intense PL emitting carbon dots.[1] We were able to show that polyaromatic hydrocarbons embedded in an amorphous carbon matrix are the source of many of their fascinating properties.[2] In this work, we look into the formation of these carbon dots in detail by stopping the synthesis at specific time points and looking for changes in size, morphology and optical properties. Additionally, we look into the effect of dopant atoms on the carbon dots. An in-depth understanding of the intricate nature of the optical properties of carbon dots could enable a more elaborate control over these properties, in turn enhancing their functionality and applicability.



Fig. 1 (a) Carbon dots fluoresce brightly when excited with UV-light. (b) Evolution of the absorption of carbon dots during the synthesis.

- 1) S. J. Zhu et al., Angew. Chem. Int. Ed., 2013, 52, 3953.
- 2) M. Fu et al., Nano Lett., **2015**, 15, 6030.