Temperature-induced emission pathways in carbon nanodots functionalized with consecutively oxidized benzyl alcohol derivatives

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Carbon nanodots (C-dots) are a particular type of nanostructured amorphous with size of ca. 10 nm. Thanks to their unique optical properties, C-dots have become a promising platform attracting sustained research interest for optoelectrical and biological applications. The photoluminescence (PL) mechanism of C-dots remains unclear and controversial, while it has been believed that the synthesis temperature determines the crystallinity of the graphitic cores whereas the precursor chemistry affects the surface states. However, Song et al. recently reported that the synthesis temperature could also play a crucial role in the formation of the surface states through temperature-induced thermal deformation of precursor molecules. In this work, thermal deformation of benzyl alcohol was induced by controlling the synthesis temperature, leading to the formation of oxidized benzyl alcohol derivatives (OBAs). These OBAs significantly affects the surface states of C-dots, and their PL wavelength could be tuned from 400 to 600 nm. Finally, we have assessed the potential of C-dots as a freestanding color filter for light-emitting devices that could be used for color pixels of future displays.