# Aggregation-caused Quenching Origin of Carbon Dots and Realization of their Solid-state Luminescence

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Carbon dots (CDs), fluorescent carbon nanoparticles, with the advantages of strong luminescence, low toxicity, easy preparation, and abundant precursors, have gained much attention due to their potential to replace conventional phosphors. However, aggregation-caused quenching (ACQ) of CDs in solid-state hinders the development in applications such as inkjet printing and optoelectronic devices which require solid-state phosphors. Here, we report the origin of ACQ of CDs in terms of structural features, and solid-state luminescence of the CDs has been realized by regulating the degree of crystallinity. By changing the mass ratio of precursors, we prepared two types of CDs; quenched CDs and luminescent CDs. From comparison, less amount of $sp^2$ domains in CD structure was more favorable for solid-state luminescence, and luminescent CDs exhibited yellow emission at 530 nm in solid-state. Even the quenched-CDs with a QY of 0% showed a QY of 7.8% at 518 nm in a powder form by reducing crystalline content in CDs with carbonization time control. This research would offer the strategy to provide anti-self-quenching property to CDs and open the way to the development of solid-state CDs.