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Chiral Carbon Quantum Dots for Paper-Based Photoluminescent Sensing Platforms

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Abstract : Current trends in the wide-scale sensing technologies rely on the development of miniaturized, rapid and easy-to-use sensing platforms. Quantum dots (QDs) with strong and easily tunable luminescence and high emission quantum yields have become a well-established photoluminescent nanomaterials for sensor applications. Although the majority of the reports focused on the cadmium-based QDs which have toxic effect on biological systems and eventually would cause serious environmental problems, carbon-based quantum dots (CQDs) that do not contain any toxic class elements have attracted substantial research interest in recent years. CQDs are small carbon nanostructures (less than 10 nm in size) with various unique properties and are widely-used in different fields during the last few years. In this respect, chiral nanostructures have become a promising class of materials in various areas such as pharmacology, catalysis, bioanalysis and (bio)sensor technology due to the vital importance of chirality in living systems. We herein report the synthesis of chiral CQDs with D- or L-tartaric acid as precursor materials. The optimum experimental conditions were examined and the purification procedure was performed using ethanol/water by column chromatography. The purified chiral CQDs were characterized by UV-Vis, FT-IR, XPS, PL and TEM techniques. The resultants display different photoluminescent characteristics due to the size and conformational difference. Considering the results, it can be concluded that chiral CQDs is expected to be used as optical chiral sensor in different platforms.

Keywords : carbon quantum dots, chirality, sensor, tartaric acid
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