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Fluorescent carbon dots based ratiometric pH sensor for direct detection of *Escherichia coli* O157:H7

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For sensitive detection of E. coli O157:H7, we report a one-step synthesis of highly water-soluble, biocompatible, fluorescent and pH-sensitive Carbon Dots (CDs) and their practical application in constructing ratiometric pH sensor. We developed a simple and easy way to synthesize hydrophilic CDs by the controlled carbonization of sucrose with the help of sulfuric acid. The as-synthesized CDs are emitting bright green luminescent light without any further treatment, such as passivation. Detailed fluorescence study showed under the excitation of 410 nm and 350 nm, the ratios of fluorescence intensity ($Log[I_{F410}/I_{F350}]$) changed linearly in the range of pH 4.9 to 6.9, in Britton-Robison buffer. As, bacterial growth generally reduces the pH of the growth medium due to the release of acidic metabolites such as lactic acid, acetic acid and CO_2, etc. Based on this principle, taking advantage of exclusive emission property of the synthesized CDs, they were successfully used for sensing *E. coli* O157:H7 growth. While calculating fluorescent intensity of mixture, a linear relationship of *E. coli* concentration with the fluorescence intensity ($Log[I_{F410}/I_{F350}]$) of the mixture was observed. The practical applicability of the synthesized CDs based ratiometric pH sensor was confirmed to detect E. coli O157:H7 even in real samples like milk and lake water. The Limit of Detection (LOD) was approximately 1 CFU/mL. In conclusion, the synthesis of our hydrophilic, biocompatible, pH sensitive and fluorescent CDs and their application for detection of E. coli O157:H7 were all artless, rapid, cheap and efficient practices.

Biography

Qiaoli Yang is currently a PhD candidate at the Department of Biomedical Engineering, Huazhong University of Science and Technology, under supervision of Professor Shenqi Wang. Her research interests include the development of nanocomposite and construction of bacteriophage based sensors for sensitive and selective detection of bacteria.

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