Fluorescent Carbon Nano-particles (CNPs) for Explosive Sensing

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Abstract

An ultrafast and facile method for the preparation of fluorescent nitrogen-doped carbon nanoparticles (CNPs) has been developed from a single precursor (ammonium citrate dibasic serving as both carbon and nitrogen sources) using cheap home-use microwave oven. The obtained CNPs showed strong blue fluorescence with a quantum yield of ~ 20% and displayed excitation-independent fluorescence behavior. The effects of preparation conditions on fluorescence behavior of CNPs were systematically investigated, while the as-prepared CNPs were thoroughly characterized using various advanced techniques. The mechanism of nanoparticle formation was also discussed and proposed. Furthermore, it was interestingly found that explosive picric acid (PA) could quench the fluorescence signal of CNPs significantly and selectively, while other nitroaromatic explosives have insignificant effect on its fluorescence intensity. The excellent sensing performance to picric acid could be attributed to the synergistic effect of its low molecular orbitals, the presence of fluorescence resonance energy transfer as well as acid-base interactions between picric acid and fluorescent CNPs. These findings here suggest a simple way to prepare highly fluorescent CNPs, which holds great promise in the development of sensitive and selective sensors for PA detection.

Bio

Sichen Zhang is a master student in the Department of Biomedical Engineering, University of Connecticut, USA. He earned his Bachelor degree in 2011 from Hefei University, China. His research focus on fluorescent CNPs for multiple applications.

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