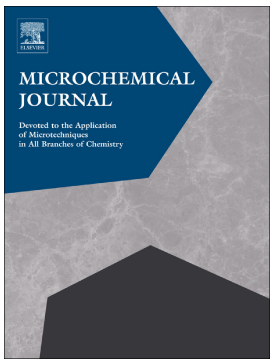

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An Efficient Strategy for Sensing Pyrophosphate Based on Nitrogen-Rich Quantum Dots Combined with Graphene Oxide

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Abstract: A facile approach was developed to prepare fluorescent nitrogen-rich quantum dots (NCQDs) using 2-azidoimidazole and ammonium hydroxide as reactants. The nitrogen and carbon elements of NCQDs form the frameworks of their nanostructures together and bear multiple active sites. By using NCQDs as fluorophores and graphene oxide (GO) as controllers, a hydrogen binding-based nanosensor was constructed for the detection of pyrophosphate (PPi). In NCQDs-GO sensing assemblies, the binding of GO to NCQDs results in the fluorescence quenching by FRET mechanism; while the addition of PPi leads to the fluorescence recovery of NCQDs because of the competitive binding between NCQDs and PPi to GO. The fluorescence intensity showed linearity with the added PPi concentration ranging from 0 to 400 μM with the detection limit of 8.3 nM (σ =3). This procedure for the fabrication of amino-functionalized carbon quantum dots is simpler and more efficient compared to conventional doping and surface modification methods. The proposed NCQDs-GO sensing assemblies showed high selectivity and sensitivity to PPi over the competing anions in aqueous solution.

Keywords: nitrogen-rich quantum dots; synthesis; nanosensors; pyrophosphate detection

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