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Photoluminescence enhancement of silver nanoclusters assembled on the layered double hydroxides and their application to guanine detection

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Abstract

Development of the fluorescent and stability-enhanced scheme for silver nanoclusters is challengeable. In the present study, silver nanoclusters stabilized by nuclear fast red sodium salt (NFR) were assembled with Mg_2Al-layered double hydroxide (LDH) nanosheets. The as-prepared films (AgNCs-NFR/LDH UTFs) were confirmed by powder X-ray diffraction (XRD), UV-vis, fluorescence spectra,atomic force microscope (AFM) and scanning electron microscope (SEM). Owing to the confined effects of 2D layered LDH nanosheets, the fluorescence intensity and photostability of AgNCs-NFR/LDH UTFs have improved significantly in comparing with that of AgNCs-NFR solution. By introducing Cu^{2+} ions as a modulator, AgNCs-NFR/LDH UTFs were applied successfully to determination guanine in the concentration range of 10–20 μM and 20–100 μM. The limit of detection was 1.85 μM guanine. Moreover, the selectivity for guanine over the other nucleotide bases (such as adenine, thymine, cytosine and uracil) and some potential interfering substances were investigated. The constructed sensor films were simple and economic which avoided a sophisticated synthetic process, and the detected reactions completed within 5min.