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# Intracellular DNA and microRNA sensing based on metal-organic framework nanosheets with enzyme-free signal amplification

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## Abstract

A new fluorescent sensing platform based on ultrathin metal-organic framework (MOF) nanosheets (MnDMS) was prepared from the flexible ligand 2,2-dimethylsuccinate and Mn ions. The MnDMS nanoparticles can be obtained by simply ultrasonication of the MnDMS crystal, and then can be exfoliated into nanosheets by Li-intercalation method. The MnDMS nanosheets can be easily assembled with biological probes, leading to efficient fluorescence quenching of the fluorophore tagged ssDNA and microRNA (miRNA). By using a hybridization chain reaction (HCR) strategy, the fluorescence signal can be obviously amplified. A good linearity was obtained from 1 pM to 200 pM of target ssDNA, with a detection limit of 0.2 pM. The HCR/MnDMS system provides an effective way to monitor miRNA in living cells. Therefore, the MnDMS nanosheets can be used as a new kind of platform in biomedical sensing applications.

**Keywords:** Metal-organic framework nanosheets; Fluorescence; Hybridization chain reaction; DNA or microRNA sensing; Living cells; Signal amplification.

## 1. Introduction

Two-dimensional (2D) nanomaterials have been extensively explored for applications in a large variety of fields including nanocomposite materials, catalysis, biosensing and drug delivery.[1] Among the 2D nanomaterials, graphene and its derivatives (graphene oxide, GO) were mostly studied because of their excellent electronic and optical features.[2-5] Particularly, both graphene and GO exhibit great fluorescence

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