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A novel turn-on fluorescent probe for Al³⁺ and Fe³⁺ in aqueous solution
and its imaging in living cells

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Abstract: A quinoline-based fluorescence probe has been prepared and characterized. Probe **1** showed a selective sensing ability for Al³⁺ and Fe³⁺ ion through fluorescence enhancement response at 515 nm when it was excited at 360 nm. In the presence of Fe³⁺ ion, probe **1** exhibited a detection limit of 2.10×10⁻⁶ M. As for Al³⁺, its detection limit of 3.58×10⁻⁷ M was significantly lower than the highest limit of Al³⁺ in drinking water recommended by the WHO (7.41 μM), representing a rare example in reported fluorescent probe for Al³⁺ ion. The fluorescence microscopy experiments have demonstrated that probe **1** could be used in live cells for the detection of Al³⁺ and Fe³⁺ ions.

Keyword: Quinoline, probe, Fluorescence turn-on, Al³⁺ and Fe³⁺ detection

1. Introduction

Aluminum and Iron element are very important to biological and environmental systems[1-3]. Aluminum is the most abundant metallic element in the earth's crust and is extensively used in our daily life, such as aluminum-based pharmaceuticals and storage/cooking utensils which results in a moderate increase in the Al³⁺ concentration in food. Due to the frequent used of aluminum foil and vessels, the risk of absorption of Al³⁺ ions by the human body is increasing. Conversely, Fe³⁺ ions play an essential part in a variety of vital cell functions such as hemoglobin formation, muscle and brain function, and electron transfer processes in DNA and RNA synthesis[4-9]. However, abnormal concentrations of Al³⁺ and Fe³⁺ ions may result in numerous diseases such as bone softening, encephalopathy and Alzheimer's disease[10-12]. Thus, there is an urgent need to develop high selectivity and sensitivity probes that are capable of detecting the presence of Al³⁺ and Fe³⁺ ions in the environment and biological samples[13]. In the past few years, many probes have been reported for

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