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A near-infrared fluorescent probe for rapid detection of Carbon Monoxide in living cells

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Abstract:

A near-infrared (NIR) and colorimetric fluorescent probe system was developed for Carbon Monoxide (CO) via a Pd⁰-mediated Tsuji-Trost reaction. In this probe, phenoxide anion formation (DPCO⁻) was acted as the signal unit and an allyl carbonate group was used as the recognition unit. This non-fluorescent probe molecule can release the relevant fluorophore after conversion of Pd²⁺ to Pd⁰ by CO. The probe system including probe 1 and Pd²⁺ can be used for “naked-eye” detection of CO, and exhibited high selectivity to CO over various other sensing objects. More importantly, the probe system has great potential for fluorescence imaging of intracellular CO in living cells.

Keywords: Near-infrared, Fluorescence probe, Carbon Monoxide, Living cells

1. Introduction

In the human body and other biological systems, carbon monoxide (CO) can be endogenously produced during the haem catabolism by heme oxygenase (HO) enzymes, which is an important cell signaling molecule with substantial therapeutic potential protecting from vascular, inflammatory, or even cancer diseases. [1, 2] More importantly, it is now evident that CO can be used as a potential therapeutic agent because of its reported antihypertensive, anti-inflammatory and cell-protective effects. [3] Therefore, it is critically required to develop “smart” noninvasive imaging reagents for the determination of CO in living systems.

In recent years, several analytical technologies have been developed to

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