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Communication

A pinacol boronate caged NIAD-4 derivative as a near-infrared fluorescent probe for fast and selective detection of hypochlorous acid

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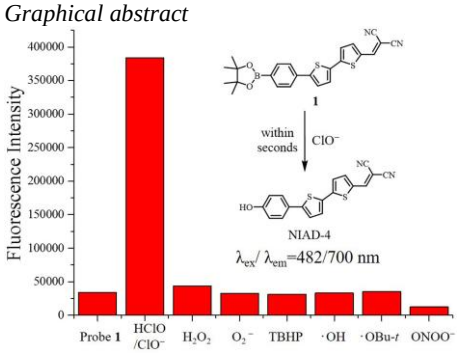
Graphical abstract



A pinacol boronate caged NIAD-4 derivative was demonstrated to be a near-infrared fluorescent probe for fast and selective detection of hypochlorite over other ROS species.

ABSTRACT

Hypochlorous acid (HOCl) is one of highly reactive oxygen species (ROS). It is involved in both immune defense against invading microbes and the progression of many diseases including cardiovascular disease and neurodegeneration disorders. It is generated from hydrogen peroxide (H_2O_2) and chloride ions in the presence of myeloperoxidase in activated neutrophils. To illustrate HOCl's biological functions, fluorescent probes, particularly those fluorescence emissions are in the near-infrared range, are highly needed for *in vivo* applications. Herein, we reported the design of a pinacol boronate caged near-infrared (NIR) fluorescent probe **1** derived from an A*β* binding fluorophore NIAD-4 for fast and selective detection of HOCl/ClO^- over other ROS. Upon exposure to HOCl/ClO^-, the pinacol boronate caging group of the probe **1** was quickly converted to electron-donating hydroxyl group, which increased intramolecular charge transfer (ICT) in the excited state and resulted in the red-shift and intensity enhancement of fluorescence emission. The probe bears several unique features: 1) It could be used as either a ratiomatic or turn-on fluorescent probe; 2) Reaction of the caging group boronate with HOCl is very fast and finishes within seconds, which provides the selectivity over H_2O_2; 3) The NIAD-4 fluorophore provides additional selectivity for detection of HOCl over peroxynitrite. Moreover, the utility of the probe in imaging HOCl/ClO^- was demonstrated in *in vitro* phantom imaging studies using mouse brain homogenate as biological relevant media.

Keywords:
Fluorescent probe
Hypochlorous acid
Boronate
Reactive oxygen species (ROS)
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