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Detection and Differentiation of Cys, Hcy and GSH mixtures by ^{19}F NMR Probe

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ABSTRACT

Simultaneous detection and differentiation of biomolecules is of significance in biological research. Biothiols such as cysteine (Cys), homocysteine (Hcy), and glutathione (GSH) play an important role in regulating the vital functions of living organisms. However, existing methods for simultaneous detection and differentiation of Cys, Hcy, and GSH are still challenging because of their similarity in structure and chemical properties. Herein we report a probe that simultaneously detects and discriminates between mixtures of Cys, Hcy and GSH using ^{19}F nuclear magnetic resonance (NMR). This ^{19}F NMR probe responds rapidly to biothiols through the Michael addition reaction and subsequent intramolecular cyclization reaction allowing differentiation between Cys, Hcy and GSH through ^{19}F NMR chemical shift. We demonstrate that this ^{19}F NMR probe is a powerful method for analysis of complex mixtures.

Graphical Abstract:

Keywords: ^{19}F Nuclear Magnetic Resonance, Biothiols, Probes, Thiol-addition/intramolecular cyclization