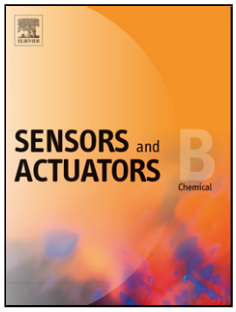

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Biological hydrogen peroxide detection with aryl boronate and benzil BODIPY-based fluorescent probes

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Highlights

- First study that compares the optical and sensing properties between the two reactive architectures for detecting hydrogen peroxide.
- Two new probes, peroxy BODIPY-1 (**PB1**) and nitrobenzoyl-BODIPY (**NbzB**) were developed.
- Sensing properties such as 1) biocompatibility; 2) cell permeability; 3) selectivity for H_2O_2 over other biologically relevant species; and 4) photostability under typical confocal microscopy experiment conditions, were compared and detailed.
- Sensing experiments in bovine oocytes were carried out as the first step towards the use of these probes for sensing H_2O_2 as associated with an increased incidence of DNA damage and reduced viability in developing embryos.

Abstract

The detection of hydrogen peroxide (H_2O_2) using fluorescent probes is critical to the study of oxidative stress in biological environments. Two important sensing architectures for detecting H_2O_2, aryl boronates and benzils, are compared here using novel boron-dipyrromethene (BODIPY) fluorescent probes. The aryl boronate PeroxyBODIPY-1 (**PB1**) and benzil-based nitrobenzoylBODIPY (**NbzB**) were synthesised from a common BODIPY intermediate in order to compare sensitivity and selectivity to H_2O_2. The aryl boronate **PB1** gives the highest change in fluorescence on reaction with H_2O_2 while the benzil **NbzB** exhibits exclusive selectivity for H_2O_2 over other reactive oxygen species (ROS). Both proved to be cell-permeable, with **PB1** being able to detect H_2O_2 in denuded bovine oocytes. The strengths of these aryl boronate and benzil probes can now be exploited concurrently to elucidate biological mechanisms of H_2O_2 production and oxidative stress.