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A whole-cell amperometric herbicide biosensor based on magnetically functionalised microalgae and screen-printed electrodes

Zamaleeva A., Sharipova I., Shamagsumova R., Ivanov A., Evtugyn G., Ishmuchametova D., Fakhrullin R.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

We report the fabrication of an amperometric whole-cell herbicide biosensor based on magnetic retention of living cells functionalised with magnetic nanoparticles (MNPs) on the surface of a screen-printed electrode. We demonstrate that *Chlorella pyrenoidosa* microalgae cells coated with biocompatible MNPs and retained on the electrode with a permanent magnet act as a sensing element for the fast detection of herbicides. The magnetic functionalisation does not affect the viability and photosynthesis activity-mediated triazine herbicide recognition in microalgae. The current of ferricyanide ion was recorded during alternating illumination periods and biosensor fabricated was used to detect atrazine (from 0.9 to 74 M) and propazine (from 0.6 to 120 M) (the limits of detection 0.7 and 0.4 M, respectively). We believe that the methodology presented here can be widely used in fabrication of a number of whole cell biosensors since it allows for efficient and reversible cells immobilisation and does not affect the cellular metabolism. © 2011 The Royal Society of Chemistry.

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