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Interfacing Living Unicellular Algae Cells with Biocompatible Polyelectrolyte-Stabilised Magnetic Nanoparticles

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Abstract

Green algae are a promising platform for the development of biosensors and bioelectronic devices. Here we report a reliable single-step technique for the functionalisation of living unicellular green algae Chlorella pyrenoidosa with biocompatible 15 nm superparamagnetic nanoparticles stabilised with poly(allylamine hydrochloride). The magnetised algae cells can be manipulated and immobilised using external permanent magnets. The distribution of the nanoparticles on the cell walls of C. pyrenoidosa was studied by optical and fluorescence microscopy, TEM, SEM and EDX spectroscopy. The viability and the magnetic properties of the magnetised algae are studied in comparison with the native cells. The technique may find a number of potential applications in biotechnology and bioelectronics.We report the functionalisation of viable algae C. pyrenoidosa cells with biocompatible polyelectrolyte-stabilised superparamagnetic nanoparticles via a single-step direct deposition. This study demonstrates that the living magnetised algae cells are susceptible for the spatial manipulation with a permanent magnet, opening new avenues for a number of practical applications, including the fabrication of whole-cell biosensors. Copyright © 2010 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

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Keywords

Encapsulation, Magnetic functionalization, Polyelectrolytes, Unicellular algae, Viability