

7th International Symposium On Macro- and Supramolecular Architectures and Materials

A colorimetric probe for dopamine based on gold nanoparticles-electrospun nanofibre composite

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Abstract

An easily prepared solid state colorimetric probe for detecting the neurotransmitter dopamine (DA) was developed. The probe, in the form of an electrospun Nylon-6 (N6) nanofibre with embedded un-functionalized gold nanoparticles (UF-AuNPs) produces a clear colour change in the presence of a DA that is detectable by the naked eye. Characterisation of the nanofibre using UV/vis spectroscopy and electron microscopy (TEM) confirmed the formation of the AuNPs in the polymer solution, and that the AuNPs were completely encapsulated within the composite nanofibres before exposure to the analytes. The probe exhibited very high sensitivity towards DA resulting in colour change of the composite fibres from purple to navy blue/black even under low concentrations of DA. The probe was also selective to DA since the colour remained unchanged in the presence of commonly encountered interfering species such as ascorbic acid, uric acid, catechol, epinephrine and norepinephrine. Moreover, the colour change was observed rapid, occurring either immediately on contact with higher concentrations (5×10^{-4} M) or within about 3–5 min for the lower concentrations (e.g. 5×10^{-7} M). Since this probe does not require the use of any instruments and is both rapid and stable over time, it can be applied in the field by an inexperienced person.

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Selection and peer-review under responsibility of the Conference Committee Members of 7th International Symposium on Macro- and Supramolecular Architectures and Materials.

Keywords: Dopamine; gold nanoparticles; electrospun nanofibres; colorimetric probe; neurotransmitters