Selective Sub-nanomolar Determination of Fe(III) Ions with Electrospun Nanofibers

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In this study, the use of electrospun nanofibrous materials as highly responsive fluorescence quenching-based iron (III) sensitive chemosensor is reported. Iron (III) sensors based on the change in the fluorescence signal intensity of fluorophore; 9-hexyl-9H-carbazole-3-carbonitrile (OCD-1) (See Figure 1). Poly (methyl methacrylate) and/or ethyl cellulose were used as polymeric materials. We designed optical chemical nanosensor by using electrospun nanofibrous materials for the determination of Fe (III) ions at nanomolar and sub-nanomolar levels. Emission based spectral data, fluorescence lifetime and photostability of the Fe (III) probe were determined in thin film, nanofibrous materials and/or in THF, respectively.

The fluorescence was distinctly quenched in the presence of Fe (III) at 420 nm and 450nm for PMMA based thin films and nanofibers matrix, respectively. In form of nanomaterials the relative signal changes were approximately better compared to the continuous thin films due to the high surface area of the nanofibrous membrane structures [1]. The preliminary results of Stern-Volmer analysis show that the sensitivities of electrospun nanofibrous membranes to detect Fe (III) ions are higher than those of the continuous thin films.

Figure1. Chemical structure of OCD-1 dye

KEYWORDS: electrospinning, optical nanosensor, time resolved fluorescence, iron (III) sensor

REFERENCES: