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Synthesis and Characterization of Molecularly Imprinted Polymer for the Removal/Extraction of Thymol from Spiked Blood Serum and River water

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Molecularly imprinted polymers (MIPs) were prepared by precipitation polymerization using thymol as a template molecule, acrylamide as a functional monomer and N,N-methylbisacrylamide as the crosslinker with a non-covalent approach. The polymers were characterized by scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), fourier-transform infra red spectroscopy(FT-IR) and Brunauer-Emmett-Teller (BET). The SEM results depicted that the shape of polymer particles is spherical with uniform size (micrometers). The BET results also showed better surface area, pore size and pore volume of MIP as compared to non-imprinted polymer (NIP). A series of parameters such as initial concentration, polymer dosage, effect of pH and slectivity with structural analogue were conducted. The selectivity of MIP towards thymol was appreciable as compared to its structural analogue gallic acid with a relative selectivity coefficient of 3.59. Finally, MIP has been successfully used for extraction of thymol from the spiked blood serum (84 %) and river water sample (98 %).

Keywords: Thymol, Molecularly imprinted polymers, Extraction, Blood serum, River water.

INTRODUCTION

Thymol (5-methyl-2-(methyl ethyl)phenol), a constituent of oil of thyme, a naturally occurring mixture of compounds in the plant (*Thymus vulgaris* L., or thyme) [1]. It is an active ingredient in pesticide products for animal repellent, fungicide, medical disinfectant, tuberculocide and virucide. Thymol has also many non-pesticidal uses, such as in perfumes, mouth washes, food flavouring, pharmaceutical preparations, cosmetics and also as a stabilizer to several therapeutic agents, including halothane [2,3]. Thymol is widely used in the chemical industry to stabilize and to store solutions and serum samples [4]. Thymol resembles phenol in its action, but owing to its insolubility in body fluids, its absorption is much more slow and less irritant to wounds, while its germicidal action is greater than that of phenol but less than that of naphthol. Thymol is considered as a mild irritant and less toxic but it can also cause gastric pain, nausea, vomiting, central hyperactivity, *etc*. in human beings. The continuous disposal of thymol in the environment may also cause harmful effects to the aquatic life. Therefore, monitoring of thymol is very important in both biological and environmental samples.

A number of analytical methods have been reported for the determination of thymol, such as HPLC [5-10], LC with electrochemical detection [11], gas chromatography [12-18], differential pulse voltammetry [19], spectrometry [20,21], colorimetric analysis [22], TLC [23,24] and flow injection spectrophotometry [25]. However, some of these methods are expensive, time consuming and/or require several tedious conditions. In this work, a rapid and sensitive method using molecularly imprinted polymers was proposed for the determination of thymol in environmental and biological samples. This technique is safe, simple, fast and accurate and has been satisfactorily applied to the extraction/removal of thymol in river water and human blood serum.

Molecular imprinting is a technology that facilitates the production of artificial receptors towards compounds of interest [26]. Molecularly imprinted polymers (MIPs) are porous materials with specific binding cavities for recognition of a particular target molecule. Molecularly imprinted polymers have many