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Selective extraction of Ascorbic acid by molecular imprinted polymer solid-phase extraction

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ABSTRACT

A Highly sensitive and selective molecular imprinted polymer (MIP) was synthesized for solid phase extraction and preconcentration of trace amount of Ascorbic acid (AA). Parameters affecting separation and synthesis the polymer such as volume of the solvent, equilibration time, material selectivity and capacity, time, pH, … were checked by ultraviolet (UV) spectroscopy. Then the imprinted polymer applied for extraction of AA with solid-phase extraction, the process done with batch method. The selectivity of method was checked using some real samples. Linear range of the method was examined the data obtained showed linearity over the range of 0.4-9.0 mg/L.

1. Introduction

Vitamin C is an essential nutrient in human and an important water-soluble electron donor in living organisms .Vitamin C has been widely accepted as the most important hydrophilic antioxidant because of having specific and unspecific biological functions and an specific cofactor in enzymatic reactions. Studies have shown that vitamin C deficiency and human mortality are effectively linked [1]. L-Ascorbic acid (AA) (Fig 1) is the main biologically active form of vitamin C. [2]

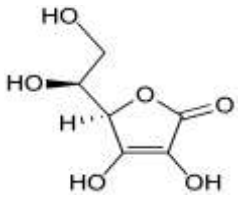

Figure 1. Molecular structures of Ascorbic acid

Although it cannot be syntheses by human, so their main source of the vitamin C is from fruit and vegetables. Therefore, it is very important to carefully study the amount of nutrients in fruits and vegetables and their effect on human health. Some classical and instrumental methods like titrimetry [3], spectrometry [4] and electrochemistry have been used for determination of vitamin C [5]. The best method for determination of AA is separation techniques like liquid chromatography (LC) and Solid phase micro extraction (SMPE) [6-7]. Molecular imprinted polymers [8, 9] have received much attention as a method for preconcentration and initial preparation for measurement methods [10]. Molecularly imprinted polymers (MIPs) are synthetic polymers that synthesised by copolymerizing a monomer with a cross-linker in the presence of a template molecule (print molecule). The template molecule was washed after polymerization .The polymer after washing the template contains sites that was made for template therefore is suitable for target molecule in terms of size, shape and chemical function so the synthesized polymer can perfectly rebind with the template (analyte) and the same molecules. There molecular imprinted polymers could showed highly selective recognition characteristics that is comparable to biological compounds. However, MIPs have several advantages to the biological compounds including, easy preparation, low cast and excellent chemical and physical stability in a wide range of experimental conditions and different solvents. SPME can provide a powerful analytical tool that has the simplicity, application and selectivity of both methods [11]. In this study, the MIP was synthesized for use as sorbent in solid phase extraction of AA. Applicability of the method in real samples was tested and it is found that

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