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Development of novel hybrid imprinted membranes for selective recovery of Theophylline

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Abstract

A theophylline-binding polymer was synthesized utilizing the bulk polymerization technique. Methacrylic acid, ethylene glycol dimethacrylate, 2,2'-azoisobutyronitrile and chloroform were used to synthesize the imprinted polymer. Theophylline was employed as template. The obtained polymer powder were dispersed in the modified poly(ether ether ketone) (PEEK-WC) polymer solution for preparing hybrid imprinted membranes *via* the phase inversion technique. Membranes containing the non-imprinted polymer were also prepared and used as reference.

For evaluating the recognition properties of polymers and membranes re-binding experiments, with the template and its structural homologue caffeine, were carried out.

The binding capacity of MIP towards the template was 1.18 $\mu\text{mol/g}_p$ and the theophylline/caffeine selectivity factor was 3.2.

All the imprinted membranes exhibited good recognition properties compared with blank membranes, which only showed a poor non-specific binding.

The membrane containing 30 wt. % of the imprinted polymer exhibited the highest binding capacity (10.97 $\mu\text{mol/g}_{\text{memb.}}$), and a theophylline/caffeine selectivity factor of 71.42.

Keywords: Solid-phase extraction; molecular imprinting; hybrid membranes; theophylline; recognition properties.

1. Introduction

Theophylline (THEO) is a xanthine employed in the treatment of asthmatic symptoms, such as the chronic obstructive pulmonary disease, asthma and chronic bronchospasm [1-4].

Asthma is an inflammatory disease, often associated with allergies, characterized by bronchoconstriction (BPCO) and edema. Patients with BPCO have excessive production of

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