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Consequence of Multi-Templating of Closely Related Structural Analogues on a Chitosan-Methacryllic Acid Molecularly Imprinted Polymer Matrix-Thermal and Chromatographic Traits

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Abstract : Most polluted environments, most challengingly, aerosol types, contain a cocktail of different toxicants. Multi-templating of matrices have been the recent target by researchers in a bid to solving complex mixed-toxicant challenges using single or common remediation systems. This investigation looks at the effect of such multi-templated system vis-a-vis the synthesis by non-covalent interaction, of a molecularly imprinted polymer architecture using nicotine and its structural analogue Phenylalanine amide individually and, in the blend, (50:50), as template materials in a Chitosan-Methacrylic acid functional monomer matrix. The temperature for polymerization is 60OC and time for polymerization, 12hrs (water bath heating), 4mins for (microwave heating). The characteristic thermal properties of the molecularly imprinted materials are investigated using Simultaneous Thermal Analysis (STA) profiling, while the absorption and separation efficiencies based on the relative retention times and peak areas of templates were studied amongst other properties. Transmission Electron Microscopy (TEM) results obtained, show the creation of heterogeneous nanocavities, regardless, the introduction of Caffeine a close structural analogue presented near-zero perfusion. This confirms the selectivity and specificity of the templated polymers despite its dual-templated nature. The STA results presented the materials as having decomposition temperatures above 250OC and a relative loss in mass of less than19% over a period within 50mins of heating. Consequent to this outcome, multi-templated systems can be fabricated to sequester specifically and selectively targeted toxicants in a mixed toxicant populated system effectively.

Keywords : chitosan, dual-templated, methacrylic acid, mixed-toxicants, molecularly-imprinted-polymer
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