

PYROGALLOL-IMPRINTED POLYMERS: THE
SELECTION OF MONOMERS AND ADSORPTION
STUDIES

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Pyrogallol-imprinted polymers (PIPs) were prepared using molecular imprinting approach. Pyrogallol usually can be found in natural herbs plants such as *Kacip Fatimah (Labisia pumila)*. In this study, pyrogallol has been used as a template molecule. Pyrogallol-imprinted polymers (PIPs) and non-imprinted polymers (NIPs) were synthesized *via* precipitation polymerization using three different monomers; methacrylic acid (MAA), methyl methacrylate (MMA) and 4-vinylpyridine (4-VP) in order to determine the most suitable functional monomer for adsorption of pyrogallol. The synthesized polymers were characterized by Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Brunauer-Emmett-Teller Analysis (BET) and UV-Visible Spectroscopy (UV-Vis). As the results, by increasing the adsorbent dosage, adsorption of pyrogallol onto the PIPs increased and the contact time is prolonged. Equilibrium adsorption isotherm studies are the study of binding properties and description of the interactions between adsorbent and adsorbate which give adsorption capacity of an adsorbent towards

adsorbate. In this studies, adsorption isotherm model were measured by Langmuir, Freundlich and Scatchard isotherm model. The results showed that PIP of MAA, PIP of MMA and PIP of 4-VP follow Scatchard isotherm models. In order to analyze the sorption kinetics of PIPs, two kinetic models have been applied; pseudo-first order and pseudo-second order. The results showed that all PIPs followed pseudo-second order which indicates the rate-limiting step in surface adsorption. According to the results obtained, MAA was selected as the most suitable functional monomer for detection and extraction of pyrogallol by giving the highest binding capacity of 80% compared to MMA (70%) and 4-VP (50%).

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**POLIMER TERCETAK PIRAGALOL: PEMILIHAN MONOMER DAN
KAJIAN PENJERAPAN**

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Pusat Pengajian : Pusat Pengajian Sains Asas

Polimer tercetak piragalol (PIPs) telah disediakan dengan menggunakan pendekatan pencetakan molekul. Piragalol biasanya ditemui didalam tumbuhan herba semula jadi seperti *Kacip Fatimah (Labisia pumila)*. Dalam kajian ini, piragalol telah digunakan sebagai molekul templat. Polimer tercetak piragalol (PIP) and polimer tidak tercetak molekul (NIP) telah disintesis melalui proses pemolimeran pemendakan dengan menggunakan tiga monomer yang berbeza; asid metakrilik (MAA), metilmetakrilat (MMA) dan 4-vinilpiridina (4-VP) bagi menentukan monomer berfungsi yang paling sesuai untuk penjerapan terhadap piragalol. Polimer yang telah disintesis dicirikan dengan menggunakan Spektrometer Inframerah (FTIR), Mikroskop Imbasan Elektron (SEM), Analisis Brunauer-Emmett-Teller (BET) and Spektrometer Lembayung Ungu - Nampak (UV-Vis). Daripada keputusan yang diperolehi, dengan meningkatkan dos penjerap, penjerapan piragalol keatas PIP semakin meningkat dan masa sentuhan dipanjangkan. Kajian keseimbangan penjerapan isoterma ialah kajian berkaitan ciri – ciri penjerapan dan menerangkan

mengenai hubungkait diantara penjerap dan bahan terjerap. Dalam kajian ini, model penjerapan isoterma Langmuir, Freundlich dan Scatchard digunakan. Hasil kajian menunjukkan bahawa, PIP MAA, PIP MMA and PIP-4VP mematuhi model isoterma Scatchard. Untuk menganalisis kajian kinetik bagi semua PIP, dua jenis model kinetik telah digunakan; pseudo–tertib-pertama dan pseudo–tertib–kedua. Hasil kajian menunjukkan bahawa, semua PIP mematuhi syarat pseudo-tertib-kedua yang menunjukkan kadar had jerapan pada permukaan bahan penjerap. Berdasarkan keputusan yang diperolehi, MAA telah dipilih sebagai monomer berfungsi yang paling sesuai bagi pengesanan dan pengekstrakan piragalol dengan memberikan nilai kapasiti penjerapan yang paling tinggi iaitu 90% berbanding MMA (70%) dan 4-VP (50%).