



SINTESIS KOMPOSIT MANIK KITOSAN/KARBON AKTIF DAN PEMANFAATANNYA SEBAGAI ADSORBEN GAS CO₂

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INTISARI

Telah dilakukan penelitian tentang sintesis komposit manik kitosan/karbon aktif yang digunakan sebagai adsorben gas CO₂. Sintesis komposit manik dilakukan dengan mencampurkan kitosan dengan asam asetat hingga terbentuk hidrogel dan ditambahkan karbon aktif, kemudian diteteskan ke dalam larutan NaOH dan sebagai pembanding dibuat manik kitosan. Komposit manik dikarakterisasi menggunakan FTIR dan SEM. Proses adsorpsi dilakukan dengan mengalirkan gas CO₂ pada adsorben kemudian gas ditampung dalam NaOH dan dihitung kapasitas adsorpsinya. Penentuan kapasitas adsorpsi gas CO₂ dilakukan dengan memvariasi massa karbon aktif, laju alir dan waktu kontak. Pemodelan kinetika yang digunakan dalam penelitian ini adalah model kinetika *pseudo* orde kesatu Lagergren dan *pseudo* orde kedua Ho, dan isoterm adsorpsinya digunakan isoterm Langmuir dan Freundlich.

Hasil penelitian ini menunjukkan bahwa komposit manik kitosan/karbon aktif dapat digunakan sebagai adsorben gas CO₂ dan memiliki nilai kapasitas adsorpsi yang lebih baik dibandingkan adsorben manik kitosan. Kapasitas adsorpsi didapatkan pada komposisi kitosan:karbon aktif (1:1,2) pada laju alir 30 mL menit⁻¹ dan waktu kontak 15 menit, yaitu sebesar 0,314 mmol g⁻¹. Adsorpsi gas CO₂ pada penelitian ini mengikuti model kinetika *pseudo* orde kedua Ho dengan konstanta laju reaksi sebesar 0,412 g mmol⁻¹ menit⁻¹. Model isoterm yang mewakili proses adsorpsi gas CO₂ dalam penelitian ini adalah model isoterm Langmuir yang menunjukkan adsorpsi terjadi secara homogen dengan nilai konstanta Langmuir sebesar $2,386 \times 10^3$ mol⁻¹.

Kata Kunci: adsorpsi, komposit manik, kitosan, karbon aktif, gas CO₂



SYNTHESIS OF CHITOSAN/ACTIVATED CARBON COMPOSITE BEADS AND ITS USE AS CO₂ GAS ADSORBENT

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ABSTRACT

A research on chitosan/activated carbon beads composite synthesis as carbon dioxide gas (CO₂) adsorbent has been conducted. Chitosan/activated carbon composite beads was synthesized by mixing chitosan with acetic acid to form hydrogel and activated carbon was added, followed by dropping into NaOH solution. Chitosan bead was made for comparison. Composite beads was characterized using FTIR and SEM. Adsorption process was conducted by flowing CO₂ gas on the adsorbent then the gas accommodated in NaOH solution and then the adsorption capacity was calculated. Variations of mass composition, flow rate and contact time were made to determine the optimal adsorption capacity. The kinetic modellings used in this research were pseudo first order Lagergren and pseudo second order Ho. Adsorption equilibrium was evaluated using Langmuir and Freundlich isotherm models.

The result showed that the composite beads of chitosan/activated carbon can be used as adsorbent for CO₂ gas and has better adsorption capacity than chitosan beads. The optimum adsorption of CO₂ with composite beads chitosan/activated carbon gaves, rate, contact time, ratio of chitosan:activated were 0.3143 mmol g⁻¹, 30 mL min⁻¹, 15 min, and (1:1.2) respectively. CO₂ gas adsorption in this research followed pseudo kinetic model of Ho second order with the reaction rate constant of 0.412 g mmol⁻¹ min⁻¹. The suitable isotherm model to represent adsorption process of CO₂ gas in this research was Langmuir isotherm that showed the adsorption process occurred homogeneously with Langmuir constant of 2.3863×10^3 mol⁻¹.

Keywords: adsorption, beads composite, chitosan, activated carbon, CO₂ gas