SINTESIS DAN KARAKTERISASI HIDROGEL PVA/GA/POM/CNT, DAN UJI KINERJANYA SEBAGAI MATERIAL S-CRF NaCl DAN S-CRF KCl

SKRIPSI

diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar Sarjana Sains pada Program Studi Kimia

oleh

Irine Sofianty
NIM 1907947

PROGRAM STUDI KIMIA
FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM
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Skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Program Studi Kimia Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

IRINE SOFIANTY

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disetujui dan disahkan oleh:

Pembimbing I

Dr. Hendrawan, M.Si.
NIP. 196309111989011001

Pembimbing II

Prof. Fitri Khoerunnisa, Ph.D.
NIP. 197806282001122001

Mengetahui,
Ketua Program Studi Kimia FPMIPA UPI

Prof. Fitri Khoerunnisa, Ph.D.
NIP. 197806282001122001

PERNYATAAN

Dengan ini saya menyatakan bahwa skripsi saya yang berjudul "**Sintesis dan Karakterisasi Hidrogel PVA/GA/POM/CNT, dan Uji Kinerjanya sebagai Material S-CRF NaCl dan S-CRF KCl**" beserta seluruh isinya adalah sepenuhnya karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi yang dijatuhkan kepada saya apabila di kemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

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Yang membuat pernyataan,

Irine Sofianty

NIM 1907947

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ABSTRAK

Upaya praktek pertanian ramah lingkungan telah banyak dilakukan untuk meningkatkan efektivitas pemupukan dan mengurangi dampaknya pada lingkungan. Penggunaan hidrogel sebagai material *slow-controlled release fertilizer* (S-CRF) dapat menjadi solusi dari permasalahan tersebut. Penelitian ini bertujuan untuk mengetahui kondisi optimum sintesis, karakterisasi, dan uji kinerja hidrogel dari polivinil alkohol (PVA), glutaraldehid (GA), *Premna oblongifolia Merr* (POM), dan *carbon nanotubes* (CNT). Tahapan penelitian terdiri atas (1) sintesis hidrogel PVA/GA/POM dan PVA/GA/POM/CNT; (2) karakterisasi gugus fungsi, morfologi, dan hidrofilitas; dan (3) kinerja hidrogel *swelling ratio*, *water retention,* porositas, absorpsi dan desorpsi ion natrium dan kalium. Konsentrasi PVA(%) optimum adalah 3% dengan komposisi volume optimum PVA/GA/POM adalah 15:7,5:15 dan PVA/GA/POM/CNT adalah 15:7,5:15:7. Sisa asam hidrogel dibersihkan dengan baik pada pencucian ketiga dan keempat. Spektra FTIR hidrogel PVA/GA/POM/CNT menunjukkan peningkatan dan pergeseran serapan gugus O-H, CH_2, dan C-O-C. Foto SEM hidrogel PVA/GA/POM/CNT memiliki struktur yang lebih berpori dan kasar dibandingkan PVA/GA/POM. Hidrogel PVA/GA/POM/CNT memiliki sudut kontak lebih kecil yaitu 43,27^o sedangkan PVA/GA/POM yaitu 48,27^o. Hidrogel PVA/GA/POM/CNT memiliki *swelling ratio* lebih besar yaitu 1076% dibandingkan PVA/GA/POM yaitu 675%. Uji *water retention* pada jam ke-48 menunjukkan bahwa hidrogel PVA/GA/POM/CNT mampu mempertahankan air lebih banyak yaitu 3,39% sedangkan PVA/GA/POM yaitu 0,43%. Uji porositas hidrogel PVA/GA/POM/CNT memiliki kapasitas absorbsi lebih besar yaitu 76,71% daripada PVA/GA/POM yaitu 66,85%. Uji absorpsi mengindikasikan bahwa semakin besar konsentrasi larutan NaCl dan KCl maka semakin besar ion yang terabsorpsi dan absorpsi hidrogel terhadap KCl lebih besar dibandingkan NaCl. Hidrogel PVA/GA/POM/CNT mendesorpsi NaCl dan KCl lebih besar dibandingkan PVA/GA/POM dan desorpsi KCl lebih cepat daripada NaCl.

Kata Kunci : *slow-controlled release fertilizer*, polivinil alkohol, POM, CNT, glutaraldehid.

ABSTRACT

Efforts to practice eco-friendly agriculture have been carried out to increase the effectiveness of fertilization and reduce its impact on the environment. The use of hydrogel as a slow-controlled release fertilizer (S-CRF) material can be a solution to this problem. This study aims to determine the optimum conditions for synthesis, characterization, and hydrogel performance tests of polyvinyl alcohol (PVA), glutaraldehyde (GA), Premna oblongifolia Merr (POM), and carbon nanotubes (CNT). The research stages consisted of (1) synthesis of PVA/GA/POM and PVA/GA/POM/CNT hydrogels; (2) characterization of functional groups, morphology and hydrophilicity; and (3) hydrogel performance test consists of swelling ratio, water retention, porosity, absorption and desorption of sodium and potassium ions. The optimum concentration of PVA(%) is 3% with the optimum volume (mL) composition of PVA/GA/POM is 15:7,5:15 and PVA/GA/POM/CNT is 15:7,5:15:7. Residual hydrogel acid was removed well in the third and fourth washes. The FTIR spectra of PVA/GA/POM/CNT hydrogels show increases and shifts in the absorption of the O-H, CH_2, and C-O-C groups. SEM photo of PVA/GA/POM/CNT hydrogel has more porous and rough structure than PVA/GA/POM. PVA/GA/POM/CNT hydrogel has a smaller contact angle of 43.27^o while PVA/GA/POM is 48.27^o. PVA/GA/POM/CNT hydrogel has a greater swelling ratio of 1076% compared to PVA/GA/POM which is 675%. The results of water retention test at 48 hours shows that the PVA/GA/POM/CNT hydrogel is able to retain more water, namely 3.39%, while PVA/GA/POM is 0.43%. The PVA/GA/POM/CNT hydrogel porosity test has greater absorption capacity of 76.71% than PVA/GA/POM which is 66.85%. The absorption test indicated that the greater the concentration of NaCl and KCl solutions, the greater the adsorbed ions and the hydrogel absorption of KCl is greater than that of NaCl. PVA/GA/POM/CNT hydrogels desorps NaCl and KCl more than PVA/GA/POM and KCl desorption faster than NaCl.

***Keywords** : slow-controlled release fertilizer, polyvinyl alcohol, POM, CNT, glutaraldehyde.*

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