

SINTESIS ZEOLIT/NPKTERLAPIS Cu-ALGINAT-PVA- GLUTARALDEHID SEBAGAI PUPUK LEPAS LAMBAT

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INTISARI

Sintesis zeolit/NPK terlapis Cu-alginat-PVA-glutaraldehid sebagai material pupuk lepas lambat telah dilakukan. Tujuan penelitian ini adalah mensintesis pupuk lepas lambat serta mempelajari pengaruh variasi konsentrasi Cu dalam material pelapis terhadap ketahanan pupuk zeolit/NPK dalam asam sitrat serta kinetika pelepasannya. Penelitian dimulai dengan pembuatan pupuk zeolit/NPK dan pembuatan material pelapis Cu-alginat-PVA-glutaraldehid dengan variasi konsentrasi Cu 0,0; 0,2; 0,4; 0,6; 0,8; dan 1,0 M. Pupuk zeolit/NPK yang berbentuk granula direndam dalam larutan pelapis selama 30 menit kemudian diangkat dan dikeringkan. Pupuk dan pupuk terlapis dikarakterisasi menggunakan difraktometer sinar-X dan spektrofotometer inframerah. Uji banyaknya N dan P yang terlepas dianalisis menggunakan spektrofotometer UV-Vis, sedangkan uji banyaknya K dan Cu yang terlepas dianalisis menggunakan spektroskopi serapan atom. Pelepasan NPK dan Cu dari pupuk dan pupuk terlapis dilakukan pada media asam sitrat 0,33 M selama 14 hari.

Difraktogram sinar-X menunjukkan bahwa zeolit/NPK terlapis Cu-alginat-PVA-glutaraldehid bersifat kristalin. Spektra FTIR zeolit/NPK terlapis Cu-alginat-PVA-glutaraldehid menunjukkan puncak karakteristik dari interaksi taut silang antara PVA-glutaraldehid serta Cu-alginat. Studi kinetika pelepasan NPK dan Cu pada zeolit/NPK terlapis Cu-alginat-PVA-glutaraldehid dengan konsentrasi Cu sebanyak 0,0; 0,2; 0,4; 0,6; 0,8; dan 1,0 M menunjukkan bahwa meningkatnya konsentrasi Cu sampai 0,4 M menurunkan jumlah NPK dan Cu yang terlepas. Proses pelepasan NPK dan Cu mengikuti kinetika pelepasan orde kedua semu. Tetapan laju pelepasan N, P, K, dan Cu dalam media asam sitrat pada zeolit/NPK terlapis Cu-alginat-PVA-glutaraldehid dengan konsentrasi Cu 0,4 M berturut-turut $8,49 \times 10^{-3}$; $17,48 \times 10^{-3}$; $21,73 \times 10^{-3}$; dan $8,57 \times 10^{-3} \text{ mg g}^{-1} \text{ jam}^{-1}$.

Kata kunci: alginat, Cu, glutaraldehid, PVA, taut silang

SYNTHESIS OF ZEOLITE-NPK COATED WITH Cu-ALGINATE-PVA-GLUTARALDEHYDE AS SLOW RELEASE FERTILIZER

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ABSTRACT

The synthesis of zeolite/NPK coated with Cu-alginate-PVA-glutaraldehyde as slow release fertilizer has been performed. The objectives of this study were to synthesize zeolite/NPK coated Cu-alginate-PVA-glutaraldehyde as material of slow release fertilizer and to study the effect of variations of Cu concentrations in coating material on the resistance of zeolite/NPK fertilizer and to study release kinetic in citric acid. The study was begun with the synthesis of zeolite/NPK fertilizer and Cu-alginate-PVA-glutaraldehyde coating materials with variations of Cu concentration of 0.0; 0.2; 0.4; 0.6; 0.8; and 1.0 M. Zeolite/NPK fertilizer in the form of granules was soaked in a coating solution for 30 minutes then removed and dried. Zeolite/NPK fertilizer and coated NPK fertilizer were characterized by X-ray diffractometer and infrared spectrophotometer. The determination of N and P released was analyzed using UV-Vis spectrophotometer, while the determination of K and Cu released was analyzed using atomic absorption spectroscopy. The release of NPK and Cu from zeolite/NPK fertilizer and coated zeolite/NPK fertilizer was carried out in 0.33 M citric acid medium for 14 days.

X-ray diffractogram showed that zeolite/NPK coated Cu-alginate-PVA-glutaraldehyde had crystalline structure. FTIR spectra showed characteristic of crosslinking interactions between PVA-glutaraldehyde and Cu-alginate. Study of the release kinetics of zeolite/NPK coated with Cu-alginate-PVA-glutaraldehyde with Cu concentration 0.0; 0.2; 0.4; 0.6; 0.8; and 1.0 M showed that increasing Cu concentration to 0.4 M decreased the amount of NPK and Cu released and the release process followed the pseudo second order kinetics. The release rate constants of N, P, K, and Cu in the citric acid medium on zeolite/NPK coated with Cu 0.4 M is 8.49×10^{-3} ; 17.48×10^{-3} ; 21.73×10^{-3} ; and $8.57 \times 10^{-3} \text{ mg g}^{-1} \text{ hour}^{-1}$, respectively.

Keywords: alginate, crosslink, Cu, glutaraldehyde, PVA