

SINTESIS ZEOLIT/NPK TERLAPIS ALGINAT-PVA-GLUTARALDEHID SEBAGAI PUPUK LEPAS LAMBAT

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INTISARI

Sintesis zeolit/NPK terlapis alginat-PVA-glutaraldehid sebagai material pupuk lepas lambat telah dilakukan. Tujuan penelitian ini adalah mensintesis pupuk lepas lambat serta mempelajari pengaruh variasi konsentrasi glutaraldehid dalam material pelapis terhadap ketahanan dalam asam sitrat pupuk zeolit/NPK serta kinetika pelepasannya. Penelitian dimulai dengan pembuatan pupuk zeolit/NPK dan pembuatan material pelapis alginat-PVA-glutaraldehid dengan variasi konsentrasi glutaraldehid 0,000; 0,625; 1,250; 2,500; dan 5,000%. Pupuk zeolit/NPK yang berbentuk granula direndam dalam larutan pelapis selama 30 menit kemudian diangkat dan dikeringkan. Pupuk dan pupuk terlapis dikarakterisasi menggunakan spektrofotometer inframerah dan difraktometer sinar-X. Uji banyaknya N dan P yang terlepas dianalisis menggunakan spektrofotometer UV-visibel, sedangkan uji banyaknya K yang terlepas dianalisis menggunakan spektroskopi serapan atom. Pelepasan NPK dari pupuk dan pupuk terlapis dilakukan pada media asam sitrat 0,33 M selama 7 hari.

Spektra FTIR zeolit/NPK terlapis alginat-PVA-glutaraldehid menunjukkan puncak karakteristik dari interaksi taut silang antara PVA dan glutaraldehid. Difraktogram sinar-X menunjukkan zeolit/NPK terlapis alginat-PVA-glutaraldehid bersifat kristalin. Studi kinetika pelepasan NPK pada zeolit/NPK terlapis alginat-PVA-glutaraldehid dengan konsentrasi glutaraldehid sebanyak 0,000; 0,625; 1,250; 2,500; dan 5,000% menunjukkan bahwa meningkatnya konsentrasi glutaraldehid sampai 1,250% menurunkan jumlah NPK yang terlepas. Proses pelepasan NPK mengikuti kinetika pelepasan orde kedua semu. Tetapan laju pelepasan N, P, dan K dalam media asam sitrat pada zeolit/NPK terlapis glutaraldehid 1,250% berturut-turut $8,37 \times 10^{-4}$; 2,34; dan $1,95 \times 10^{-3} \text{ mg g}^{-1} \text{ jam}^{-1}$.

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

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

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ABSTRACT

The synthesis of zeolite/NPK coated with alginate-PVA-glutaraldehyde as slow release fertilizer has been performed. The objectives of this study were to synthesize zeolite/NPK coated alginat-PVA-glutaraldehyde as material of slow release fertilizer and to study the effect of variations of glutaraldehyde concentrations in coating material on the resistance of zeolite/NPK fertilizer and study release rate reaction in citric acid. The study was begun with the synthesis of zeolite/NPK fertilizer and alginate-PVA-glutaraldehyde coating materials with variations of glutaraldehyde concentration of 0.000; 0.625; 1.250; 2.500; and 5.000%. 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 infrared spectrophotometer and X-ray diffractometer. The determination of N and P released was analyzed using UV-visible spectrophotometer, while the determination of released K was analyzed using atomic absorption spectroscopy. The release of NPK from zeolite/NPK fertilizer and coated zeolite/NPK fertilizer was carried out in 0.33 M citric acid medium for 7 days.

FTIR spectra showed characteristic of crosslinking interactions between PVA and glutaraldehyde. X-ray diffractogram showed that zeolite/NPK coated alginate-PVA-glutaraldehyde had crystalline structure. Study of the release kinetics of zeolite/NPK coated with alginate-PVA-glutaraldehyde with glutaraldehyde concentration 0.000; 0.625; 1.250; 2.500; and 5.000% showed that increasing glutaraldehyde concentration to 1.250% decreased the amount of NPK released and the release process followed the pseudo second order kinetics. The release rate constants of NPK in the citric acid medium on zeolite/NPK coated with glutaraldehyde 1.250% is 8.37×10^{-4} ; 2.34; and $1.95 \times 10^{-3} \text{ mg g}^{-1} \text{ hour}^{-1}$, respectively.

Keywords: alginate, crosslink, glutaraldehyde, PVA, release