



SINTESIS ZEOLIT/NPK TERLAPIS ALGINAT/PVA/Ca SEBAGAI PUPUK LEPAS LAMBAT

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ABSTRAK

Sintesis zeolit/NPK terlapis alginat/PVA/ Ca sebagai pupuk lepas lambat telah dilakukan. Pengaruh variasi konsentrasi PVA dalam alginat/PVA/Ca sebagai material pelapis pupuk zeolit/NPK terhadap laju pelepasan NPK dalam larutan asam sitrat juga telah dipelajari.

Penelitian dimulai dengan pembuatan pupuk zeolit/NPK dan material pelapis alginat/PVA/ Ca dengan variasi konsentrasi PVA 0, 1, 3, 5, dan 7% (b/v). Pupuk zeolit/NPK yang berbentuk granula direndam dalam larutan pelapis PVA/alginat selama 60 menit, dilanjutkan dengan perendaman dalam larutan Ca^{2+} 0,1 M selama 30 menit. Pupuk dan pupuk terlapis dikarakterisasi dengan spektrofotometer Inframerah dan difraktometer sinar X. Pelepasan NPK dari pupuk dan pupuk terlapis dilakukan pada media asam sitrat 0,33 M selama 7 hari. Unsur N dan P total dalam pupuk dan yang terlepas dianalisis dengan spektrofotometer UV-Vis, sedangkan unsur K dianalisis dengan SSA.

Hasil pengamatan secara visual menunjukkan bahwa pelapisan telah berhasil dilakukan, dibuktikan dengan terbentuknya lapisan coklat dari komposit alginat/PVA/Ca yang menutupi pori pada pupuk zeolit/NPK. Spektra FTIR zeolit/NPK terlapis PVA/alginat/Ca terdapat puncak karakteristik pada 3448 cm^{-1} yang menunjukkan interaksi antara PVA, alginat, dan zeolit. Data difraksi XRD menunjukkan zeolit/NPK terlapis alginat/PVA/Ca bersifat kristalin. Studi laju pelepasan NPK pada material terlapis menunjukkan bahwa pelepasan NPK mengikuti laju pelepasan orde kedua semu. Tetapan laju pelepasan N, P, dan K dalam media asam sitrat pada zeolit/NPK terlapis PVA/alginat/Ca dengan konsentrasi PVA 5% berturut-turut 0,012; 0,035; dan $0,025 \text{ mg g}^{-1} \text{ jam}^{-1}$.

Kata Kunci: alginat/PVA/Ca, komposit, laju pelepasan, material pelapis



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

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ABSTRACT

Zeolite/NPK coated with alginate/PVA/Ca as slow release fertilizer has been synthesized. The effect of PVA concentration in alginate/PVA/Ca composite as coating material for zeolite/NPK fertilizer on N, P, and K release kinetics in citric acid solution was also studied.

The study was begun with the synthesis of zeolite/NPK fertilizer and alginate/PVA/Ca coating material with variation of PVA concentration (0; 1 ; 3; 5; and 7% (w/v)). Zeolite/NPK fertilizer in the form of granules was soaked in a coating solution, then soaked in 0.1 M Ca solution, then removed and dried. Zeolite/NPK fertilizer and coated zeolite/NPK fertilizer were characterized with infrared spectrophotometer and X-ray diffractometer. The release behaviour of NPK from coated fertilizers was examined in 0.33 M citric acid solution as release medium for 7 days. The total N and P elemental content and those released from the fertilizer were analyzed with UV-visible spectrophotometer, while K element was analyzed with AAS.

The visual observation showed that alginate/PVA/Ca composite successfully coated zeolite/NPK fertilizer. Characteristic absorbance of FTIR at 3448 cm^{-1} showed the presence of interactions between alginate, PVA, and zeolite. X-ray diffractogram showed that zeolite/NPK coated with alginate/PVA/Ca was crystalline. Study on the release kinetics of zeolite/NPK coated with alginate/PVA/Ca showed the release process followed the pseudo second order kinetics. The release rate constants of NPK in the citric acid medium from zeolite/NPK coated PVA/alginate/Ca with PVA 5% were 0.012; 0.035; and $0.025\text{ mg g}^{-1}\text{ hour}^{-1}$, respectively.

Keywords: alginate/PVA/Ca, composite, NPK, release process