

## **SINTESIS KOMPOSIT ALGINAT/SILIKAT-Ca SEBAGAI MATERIAL PELAPIS PUPUK LEPAS LAMBAT ZEOLIT-NPK DAN KINETIKA PELEPASANNYA**

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### **INTISARI**

Sintesis komposit alginat/silikat-Ca sebagai material pelapis pupuk lepas lambat NPK telah dipelajari. Pupuk dengan kadar NPK 8:2:2 dilapisi dengan cara merendam pupuk pada larutan komposit alginat 3% (b/v) dan silikat 30% (b/b alginat) pada suhu kamar dengan pH yang divariasi lalu ditaut-silang dengan  $\text{Ca}^{2+}$ . Material terlapis kemudian dikarakterisasi menggunakan FTIR, XRD, SEM, dan UTM. Penentuan kadar N total dilakukan menggunakan metode Ehrlich, P total dilakukan dengan metode vanadat-molibdat, K dan Ca total dilakukan dengan SSA. Uji pelepasan NPK dilakukan pada media asam sitrat 0,33 M. Analisis NPK terlepas serupa dengan metode penentuan NPK total.

Hasil pengamatan secara visual menunjukkan pelapisan telah berhasil dilakukan. Kadar NPK total tidak mengalami perubahan yang signifikan. Pelapisan optimum teramati pada pH 5. Spektra FTIR menunjukkan kondisi pelapisan yang makin asam menyebabkan makin banyak silikat yang masuk ke dalam komposit pelapis. Data difraksi XRD menunjukkan kondisi pelapisan yang makin asam menyebabkan makin banyak karakter kuarsa. Citra SEM menunjukkan kondisi pelapisan yang makin asam menyebabkan morfologi material pelapis menjadi semakin kasar. Kondisi pelapisan yang makin asam menyebabkan peningkatan stabilitas mekanik material hingga 10 kali lipat. Studi kinetika pelepasan NPK pada material terlapis menunjukkan proses pelepasan NPK mengikuti kinetika pelepasan orde kedua semu. Laju pelepasan N tertinggi adalah  $0,00114 \text{ mg g}^{-1} \text{ menit}^{-1}$ , laju pelepasan tertinggi P adalah  $0,00161 \text{ mg g}^{-1} \text{ menit}^{-1}$ , dan laju pelepasan K tertinggi adalah  $0,00189 \text{ mg g}^{-1} \text{ menit}^{-1}$ .

Kata Kunci: pH, komposit, alginat/silikat-Ca, material pelapis, kinetika lepas lambat.

## **SYNTHESIS OF ALGINATE/SILICATE-Ca COMPOSITE AS COATING MATERIAL FOR SLOW RELEASE ZEOLITE-NPK FERTILIZER AND IT'S KINETICS OF RELEASE**

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### **ABSTRACT**

Synthesis of alginate/silicate-Ca composite as a fertilizers coating material has been studied. Fertilizer with NPK concentration ratio 8:2:2 was coated by submerging the fertilizer in room temperature to the coating mixture of alginate 3% (w/v) and silicate mass 30% (w/w of alginate) under variation of pH before cross-linked with  $\text{Ca}^{2+}$ . Coated fertilizers then characterized by FTIR, XRD, SEM, and UTM. Total N and total P will be measured by Ehrlich and Vanadate-Molybdate method, respectively, while total K and total Ca of will be measured by AAS. Release behaviour of coated fertilizers then examined in citric acid 0.33 M as release media. Released N and P, K, will be analyzed with the same method for determining the total nutrient content.

Coated fertilizers indicated that coating process does not effect on total nutirent content. Optimum condition on fertilizers coating process are found in pH 5. FTIR spectra indicated that acidic conditions are favoured by silica to undergo polymerization process. SEM picture indicated that more acidic conditions resulted in rough morphology of the coated surface. More acidic conditions also resulted in increasing mechanical stability of coated fertilizers up to 10 times. Release study shows that NPK release process is in accordance with pseudo-second order kinetics. Release rate constant of NPK is  $0.00114 \text{ mg g}^{-1} \text{ min}^{-1}$ ,  $0.00161 \text{ mg g}^{-1} \text{ min}^{-1}$ , and  $0.00189 \text{ mg g}^{-1} \text{ min}^{-1}$ , respectively.

Key Words: pH, composite, alginate/silicate-Ca, coating material, slow release kinetics.