

**KOMPOSIT ZEOLIT/BENTONIT/KARBON AKTIF/ALGINAT  
BERBENTUK SILINDER SEBAGAI MODEL  
PUPUK LEPAS-LAMBAT NPK**

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**INTISARI**

Komposit berbentuk silinder sebagai model pupuk lepas-lambat NPK telah berhasil dibuat dengan menggunakan bahan penyusun berupa zeolit, bentonit, karbon aktif dan alginat. Preparasi komposit dilakukan dengan variasi konsentrasi alginat (0,5; 1; dan 25%) dan variasi berat karbon aktif (0,01; 0,05; dan 0,1 g). Karakterisasi komposit dilakukan menggunakan spektrofotometer FTIR dan difraktometer sinar-X (XRD). Analisis sifat fisik komposit dilakukan melalui uji kestabilan dalam air, uji *swelling* komposit, dan uji kuat tekan.

Hasil penelitian menunjukkan bahwa komposit dengan sifat fisik paling baik diperoleh pada komposit dengan konsentrasi alginat sebesar 1% (%b/v) dan berat karbon aktif 0,05 g. Hasil uji pelepasan nutrien N, P, dan K menunjukkan bahwa komposit zeolit/bentonit/alginat/karbon aktif (ZBAC) memiliki laju pelepasan lebih lambat dibandingkan dengan NPK komersial. Proses lepas-lambat pelepasan N, P, dan K dari komposit mengikuti model kinetika orde kedua semu dengan nilai tetapan laju pelepasan N, P, dan K berturut-turut sebesar 0,0157; 0,0106; dan 0,0483 L g<sup>-1</sup> jam<sup>-1</sup>.

Kata Kunci: komposit, pupuk, lepas-lambat, dan NPK

**CYLINDRICAL SHAPED COMPOSITES OF  
ZEOLITE/BENTONITE/ACTIVATED CARBON/ALGINATE  
AS A MODEL OF NPK SLOW-RELEASE FERTILIZER**

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**ABSTRACT**

Composite moulded as cylinder shape has been successfully prepared with zeolite, bentonite, activated carbon, and alginate as the ingredients for NPK slow-release fertilizer models. The preparation of composite was conducted at various alginate concentrations (0.5; 1; and 2%) and mass of activated carbon (0.01; 0.05; and 0.1 g). Characterization of the composite cylinder was performed by FTIR spectroscopy and XRD. The composite physical properties were analyzed through the composite stability in water, water absorption capacity and compressive strength test.

This work showed that the best physical properties of composite was obtained with 1% of alginate concentration and 0.05 g mass of activated carbon. Composite of zeolite/bentonite/activated carbon/alginate (ZBAC) was able to minimize the release rate of N, P, and K nutrients compared to the commercial NPK fertilizer. The release of N, P, and K nutrients from composite followed the pseudo second-order kinetics model with the release rate constants of N, P, and K nutrients from ZBAC composite are 0.0157; 0.0106; and 0.0483 L g<sup>-1</sup> h<sup>-1</sup>, respectively.

Keyword: composite, fertilizer, slow-release, and NPK