

INTISARI

Kemampuan kembang-kerut tanah sudah menjadi subjek yang diteliti dari waktu ke waktu. Sifat kembang-kerut tanah seringkali menimbulkan rangkaian permasalahan di berbagai bidang seperti konstruksi sipil, bencana alam, hingga bidang pertanian. Dominasi lempung ekspansif smektit (2:1) pada tanah memberikan efek yang besar terhadap sifat kembang-kerut tanah karena struktur interlayer-nya yang labil. Selama ini upaya mengurangi kemampuan kembang-kerut pada tanah berfokus pada kadar airnya. Penelitian ini mencoba mempelajari upaya mengurangi sifat kembang-kerut tanah dengan berfokus meningkatkan kestabilan struktur *interlayer* lempung menggunakan metode interkalasi dan kalsinasi. Penelitian ini diuji cobakan terlebih dahulu pada lempung hasil ekstraksi tanah vertisol menggunakan interkalan kation Al dan Fe. Dosis perlakuan interkalasi kation Al dan Fe yang diujikan berdasarkan berat ekuivalen 0x; 0,5x serta 1x terhadap nilai KPK lempung. Perlakuan kalsinasi yang dicoba adalah suhu 200^o C, 300^o C dan tanpa kalsinasi. Masing-masing interaksi perlakuan diulang sebanyak 3x. Parameter yang diamati untuk menilai potensi sifat kembang-kerut adalah luas permukaan lempung, rata-rata lebar retakan, rata-rata luas bongkah, jumlah bongkah, dan kadar air setelah pengeringan, serta volume pengembangan lempung kondisi jenuh air. Hasil penelitian menunjukkan metode interkalasi dan kalsinasi secara signifikan (tingkat kepercayaan 95%) mengurangi potensi sifat kembang-kerut lempung. Perlakuan interkalan Al dan kalsinasi suhu 300^o C lebih baik dalam pembentukan struktur pilar oksida penstabil ruang *interlayer*. Lempung dengan perlakuan Al2A (interkalan Al dosis 1x KPK dengan tanpa kalsinasi) memiliki luas permukaan setelah pengeringan tertinggi 41,035 cm², dan rata-rata lebar retakan terendah 0,153 cm. Volume pengembangan Al2A paling rendah yaitu 3,6 cm³ pada hari ke 7, sedangkan lempung tanpa perlakuan (kontrol) memiliki nilai volume pengembangan hingga 10 cm³ pada hari ke 7. Perlakuan Al2C (interkalan Al dosis 1x KPK dengan kalsinasi 300^oC) dan Al2B (interkalan Al dosis 1x KPK dengan kalsinasi 200^oC) secara dominan memiliki hasil pengujian menurunkan potensi sifat kembang-kerut yang paling baik, dan dapat dijadikan pedoman untuk pengujian lebih lanjut upaya menurunkan potensi sifat kembang-kerut pada tanah.

Keyword: Interkalasi, kalsinasi, lempung, Kembang-kerut, interlayer

ABSTRACT

The ability soil to swelling-shrinking has been a subject of research from time to time. Swelling-shrinking from soil often causes a series of problems in various sector such as civil construction, natural disasters, until agriculture. The dominance of smectite (2:1) clay contribute a great effect on the swelling-shrinking on expansive soil because have unstable interlayer structure. So far, efforts to reduce the swelling-shrinking ability of the soil focused on the moisture content. This research tries to study the efforts to depress the swelling-shrinking properties of the soil by focusing on increasing the stability of the clay interlayer structure using the intercalation and calcination methods. This research was tested first on the clay extracted from vertisol soil using intercalating Al and Fe cations. The doses of Al and Fe cations intercalation treatment tested were based on the equivalent weight of 0x; 0.5x and 1x to the clay CEC value. The calcination treatments that were tried were temperature 200⁰ C, 300⁰ C and without calcination. Each treatment interaction was repeated 3 times. The parameters observed to assess the potential swelling-shrinking properties were the measure surface area of the clay, the average crack width, the average clay lump (cell) area, the number of lumps (cells), clay moisture content after drying, and the volume of swelling clay in the saturated water condition. The results showed that the intercalation and calcination methods significantly (95% confidence level) reduced the potential swelling-shrinking properties of the clay. Intercalating Al treatment and calcination at 300⁰ C were better in forming oxide pillar structure stabilizer on the interlayer space. The clay with Al₂A (Al intercalant dose 2x CEC without calcination) treatment had the highest surface clay area after drying of 41.035 cm², and the lowest average crack width was 0.153 cm. The lowest clay swelling volume of Al₂A was 3.6 cm³ on the 7th day, while the untreated (control) clay had a clay swelling volume of up to 10 cm³ on the 7th day. The Al₂C (Al intercalant dose 2x CEC with calcination 300⁰C) and Al₂B (Al intercalant dose 2x CEC with calcination 200⁰C) treatments predominantly had results the best to reduce the potential swelling-shrinking properties from clay, and can be used as a guideline for further testing efforts to reduce the potential swelling-shrinking properties of the soil.

Keyword: Intercalation, calcination, clay, swelling-shrinking, interlayer