PENGARUH STABILISASI GEOPOLIMER POFA PADA TANAH GAMBUT TERHADAP NILAI KUAT TEKAN BEBAS *(UNCONFINED COMPRESSIVE STRENGTH)*

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ABSTRAK

Tanah gambut memiliki kadar air tinggi dan kandungan organik tinggi (>75%), sehingga daya dukungnya rendah. Salah satu alternatif perbaikan adalah stabilisasi kimiawi dengan geopolimer berbasis Palm Oil Fuel Ash (POFA) yang diaktivasi oleh larutan alkali (NaOH dan Na_2SiO_3). Penelitian ini bertujuan menganalisis pengaruh penambahan geopolimer POFA terhadap nilai kuat tekan bebas (UCS) tanah gambut, menentukan kadar optimum, serta mengevaluasi pengaruh kepadatan tanah. Metode yang digunakan meliputi uji sifat fisik dan mekanis tanah, serta uji UCS pada variasi campuran POFA 10%, 15%, 20%, dan 25% dengan masa pemeraman 7 dan 14 hari pada kondisi OMC (100%) dan DSO (95%). Hasil penelitian menunjukkan bahwa penambahan POFA meningkatkan nilai UCS secara signifikan. Kadar optimum diperoleh pada penambahan 15% POFA dengan pemeraman 14 hari pada kondisi OMC, menghasilkan peningkatan UCS maksimum. Analisis modulus secant (E_{50}) dan brittleness index (I_B) mendukung hasil tersebut dengan menunjukkan peningkatan kekakuan tanah. Dengan demikian, geopolimer POFA berpotensi besar sebagai alternatif ramah lingkungan untuk perbaikan tanah gambut.

Kata kunci: tanah gambut, POFA, geopolimer, UCS, stabilisasi tanah

EFFECT OF POFA-BASED GEOPOLYMER STABILIZATION ON THE UNCONFINED COMPRESSIVE STRENGTH (UCS) OF PEAT SOIL

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ABSTRACT

Peat soil has a high water content and organic matter content (>75%), resulting in low bearing capacity. One alternative improvement method is chemical stabilization using geopolymer based on Palm Oil Fuel Ash (POFA) activated with alkaline solution (NaOH and Na_2SiO_3). This study aims to analyze the effect of POFA geopolymer addition on the unconfined compressive strength (UCS) of peat soil, determine the optimum content, and evaluate the influence of soil compaction. The methods include physical and mechanical soil tests, as well as UCS tests with POFA mixture variations of 10%, 15%, 20%, and 25%, cured for 7 and 14 days under OMC (100%) and DSO (95%) conditions. The results show that the addition of POFA significantly increases UCS values. The optimum content was obtained at 15% POFA addition with 14 days of curing under OMC conditions, producing the maximum UCS improvement. Analysis of secant modulus (E_{50}) and brittleness index (I_B) supports these findings by indicating an increase in soil stiffness. Therefore, POFA-based geopolymer has great potential as an environmentally friendly alternative for peat soil stabilization.

Keywords: peat soil, POFA, geopolymer, UCS, soil stabilization