

LIQUEFACTION RISKS ON BULK CARGOES CARRYING UNAMENDED &
AMENDED GEBENG BAUXITE IN ACCORDANCE TO INTERNATIONAL
MARITIME SOLID BULK CARGOES CODE

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ABSTRACT

Improving aggregate formation and stability of bauxite is essential in order to understanding the risk of liquefaction in bulk cargoes. Effects of gypsum and vermicompost on related chemical and physical conditions of bauxite residue were studied in a laboratory incubation experiment. Addition of gypsum at 2% and 4% w/w reduced pH and exchangeable sodium percentage, whilst increasing exchangeable calcium content. Addition of vermicompost reduced bulk density, whilst significantly increasing porosity and total organic carbon. Vermicompost had a positive effect on the formation and stabilization of water-stable aggregates in the residue, whilst gypsum was more beneficial to silt-sized micro aggregate flocculation. Amendments also enhanced the erosion resistance of bauxite residue. Furthermore, wet sieving using the modified Le Bissonnais' (LB) method revealed that in comparison to differential clay swelling and mechanical breakdown, slaking was the major disaggregation mechanism of residue aggregates. The combination of gypsum and vermicompost converted the residue from a sheet-like structure to a granular macro aggregated structure, whilst converting micro aggregates from a grain to a granular or prismatic structure. The findings of this work suggest that application of gypsum and vermicompost to bauxite residue may directly influence aggregate size distribution and its micromorphology, resulting in the improvement of both aggregate stability and structure to reduce liquefaction risk.

ABSTRAK

Meningkatkan pembentukan agregat dan kestabilan bauksit adalah penting untuk memahami risiko pencairan dalam kargo pukal. Kesan gipsum dan vermicompost pada keadaan kimia dan fizikal berkaitan residu bauksit telah dikaji dalam percubaan inkubasi makmal. Penambahan gipsum pada 2% dan 4% w / w dikurangkan pH dan peratusan natrium yang boleh ditukar, sementara kandungan kalsium yang boleh ditukar tambah. Penambahan vermicompost dikurangkan ketumpatan pukal, sementara peningkatan keliangan dan jumlah karbon organik meningkat dengan ketara. Vermicompost mempunyai kesan positif ke atas pembentukan dan penstabilan agregat air yang stabil dalam residu, manakala gipsum lebih bermanfaat untuk pemberbukuan agregat mikro bersaiz keli. Pindaan juga meningkatkan rintangan hakisan residu bauksit. Tambahan pula, sieving basah menggunakan kaedah Le Bissonnais '(LB) yang telah diubahsuai menunjukkan bahawa berbanding dengan pembezaan tanah liat pembezaan dan kerosakan mekanikal, pengambilan adalah mekanisme pengagregatan utama agregat residu. Gabungan gipsum dan vermicompost menukarkan residu dari struktur seperti lembaran ke struktur agregat makro granular, sementara menukar agregat mikro dari bijirin ke struktur granular atau prisma. Penemuan karya ini mencadangkan penggunaan gipsum dan vermicompost kepada residu bauksit secara langsung boleh mempengaruhi pengedaran saiz agregat dan micromorphologynya, yang menghasilkan peningkatan kestabilan dan struktur agregat untuk mengurangkan risiko penguraian.