

Studies on factors affecting unconfined compressive strength of industrial rubber sludge containing heavy metals treated using ordinary Portland cement via stabilization/solidification technique

Abstract

High concentration of selected heavy metals within industrial rubber sludge collected from rubber industry wastewater treatment plant has classified the waste as scheduled waste. Special treatment to the waste by using ordinary Portland cement via solidification/stabilization (S/S) technique has been performed in laboratory scale. The objective of this research is to determine related factors that affect unconfined compressive strength (UCS) performance of stabilised/solidified (s/s) cube specimens which contains industrial rubber sludge waste. Other parameters observed include the curing condition (i.e. air and water immersion curing method), waste composition, specimen age and density. The prepared fresh mix were cast in plastic moulds in order to produce 50 mm³ cubical shape specimens and leaved to set approximately 24 to 48 hours. The prepared specimen batches are S1 (90% OPC + 10% waste), S2 (70% OPC + 30% waste), S3 (50% OPC + 50% waste). UCS was performed on respective specimen age of 7 and 28 days. Positive results were obtained as relatively the average compressive strength of 7 day air cured specimens reach 5.25 MPa, 5.28 MPa, and 2.16 MPa for S1, S2 and S3. While, 28 days air cured specimens results are 9.59 MPa, 8.01 MPa, and 1.46 MPa for S1, S2, and S3 respectively. As for water immersion, the compressive strengths are 8.19 MPa, 4.93 MPa, and 1.90 MPa for 7 days, and 7.75 MPa, 10.10 MPa, and 2.11 MPa for 28 days at respective S1, S2 and S3 sequence. As conclusion, the specimens prepared passed the minimum requirement for secured landfill disposal which is at 1 MPa.