Use of natural pozzolana in stabilizing lightweight volcanic aggregates for roadbase construction in Tanzania

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The aim of the research was to explore whether marginal materials like lightweight Volcanic Aggregates (LVA) could economically and effectively be stabilized using natural pozzolana to conform to roadbase specifications. The combinations of natural pozzolana with lime, natural pozzolana with natural activator, natural pozzolana with lime and natural activitors included natural gypsum, dolomite and soda ash. The materials studied included three types of natural pozzolana and two types of LVA materials from Arusha Region in Tanzania. Standard tests on physical properties for materials before and after stabilization of mixes were conducted mostly based on standards, specifications and test methodology of the Ministry of Works (Tanzania). Further, specialized chemical and mineralogy analyses using x-ray fluorescence (XRF) and x-ray diffraction (XRD) methods were carried out on raw materials and on the stabilized mortar samples of natural pozzolana-lime and natural pozzolana-lime-gypsum mixes. Laboratory test results and statistical analyses have shown that natural pozzolana-lime binder could stabilize LVA to achieve roadbase requirements at a dosage of less than 2 percent of lime with between 10 to 30 percent of natural pozzolana. Natural pozzolana-gypsum-lime binder mixes were found to develop significantly higher Unconfined Compressive Strength (UCS) than pozzolana-lime binder mixes. The research has concluded that although the three types of natural pozzolana that were studied have significant variations on their chemical, mineralogy and physical characteristics, they can all be economically activated by locally obtainable lime for use in stabilizing marginal materials to meet the specifications for roadbase construction in Tanzania. Furthermore, gypsum-lime-natural pozzolana binder mixes could also economically stabilize Lightweight Volcanic Aggregates (LVA).