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Potential Use of Local Materials as Synthesizing One Part Geopolymer Cement

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Abstract : The work on indigenous binders in this paper focused on the following indigenous raw materials: red clay, red lava and pumice (as primary aluminosilicate precursors), wood ash and gypsum (as supplementary minerals), and sodium sulfate and lime (as alkali activators). The experimental methods used for evaluation of these indigenous raw materials included laser granulometry, x-ray fluorescence (XRF) spectroscopy, and chemical reactivity. Formulations were devised for transforming these raw materials into alkali aluminosilicate-based hydraulic cements. These formulations were processed into hydraulic cements via simple heating and milling actions to render thermal activation, mechanochemical and size reduction effects. The resulting hydraulic cements were subjected to laser granulometry, heat of hydration and reactivity tests. These cements were also used to prepare mortar mixtures, which were evaluated via performance of compressive strength tests. The measured values of strength were correlated with the reactivity, size distribution and microstructural features of raw materials. Some of the indigenous hydraulic cements produced in this reporting period yielded viable levels of compressive strength. The correlation trends established in this work are being evaluated for development of simple and thorough methods of qualifying indigenous raw materials for use in production of indigenous hydraulic cements.

Keywords : one-part geopolymer cement, aluminosilicate precursors, thermal activation, mechanochemical
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