عنوان مقاله:

Recycling of Eggshell Powder and Wheat Straw Ash as Cement Replacement Materials in Mortar

محل انتشار:

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خلاصه مقاله:

Cement is among the important contributors to carbon dioxide emissions in modern society. Researchers are studying solutions to reduce the cement content in concrete to minimize the negative impact on the environment. Among these solutions is replacing cement with other materials, such as waste, which also poses environmental damage and requires landfill areas for disposal. Among these wastes are eggshell powder ash (ESPA) and wheat straw ash (WSA), which were utilized as cement substitutes in green mortar production. Thirteen mixtures were cast, one as a reference without replacement and twelve others that included replacing ESPA and WSA (single and combined) with cement in ۲%, ۴%, ۶%, and ۸% proportions of cement's weight. The mechanical (compressive and flexural strength), microstructural (SEM), and thermogravimetric analysis (TG/DTA) properties of all mixtures were examined. The results showed a remarkable improvement in mechanical properties, and the best improvement was recorded for the (۴%ESPA+۴%WSA) mixture, which reached ۷۳.۳% in compressive strength and ۵۶% in flexural strength, superior to the reference mixture. Furthermore, SEM analyses showed a dense and compact microstructure for the ESPA and WSA-based mortars. Therefore, the WSA and ESPA wastes can be recycled and utilized as a substitute for cement to produce an eco-friendly binder that significantly improves the microstructural and mechanical characteristics of mortar. In addition, combining the two materials also presents a viable option for creating a sustainable ternary blended binder (with cement) that boasts superior properties compared to using the WSA or ESPA individually. Doi : ۱۰.۲۸۹۹۱/CEJ-۲۰۲۴-۰۱۰-۰۱-۰۵ Full Text : PDF

کلمات کلیدی:

.Eggshell Powder Ash; Wheat Straw Ash; Mechanical Properties; SEM; Differential Thermal Analysis