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Editorial

Advances and New Challenges for Recycled Aggregate Concrete

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The world's waste production is at its highest level ever following the development of new world powers. This is particularly evident in construction/demolition activities, which have one of the largest contributions to the economic growth and waste generation, therefore requiring stricter policies to encourage sustainability.

Concrete is the favourite choice as a construction material among civil engineers around the globe for decades, due its better performance, longer life, and low maintenance cost. However, the continuous necessity and increase for raw materials of concrete, especially coarse aggregate, due to a rapid building construction, tends to increase the danger of early exhaustion of the natural resources. The recycled coarse aggregate plays a great role as an alternative raw material that can replace the natural coarse aggregate for concrete. With the wave of sustainability on construction, new sustainable and reusable construction materials are needed. One such material is recycled aggregate concrete.

This special issue had a good acceptation by the scientific community with several papers submitted and 7 papers accepted for publication. A considerable number of experimental papers address new research advances and applications in recycled aggregate concrete. K. H. Younis et al. present an experimental research study that investigates the effect of utilizing metakaolin on the behaviour of recycled aggregate concrete. Based on the experimental results, the authors showed that metakaolin reduces the workability of the recycled aggregate concrete mixes; however, the use of metakaolin improves the compressive, splitting tensile, and flexural strengths and the elastic modulus of recycled aggregate concrete.

Z. Yao et al. analyse the static and dynamic mechanical characteristics of the coal gangue concrete used to replace coarse and fine aggregates in concrete, in mine support structures. Their results showed, between others, that the addition of coal gangue fine aggregate has a positive effect and the addition of coal gangue coarse aggregate has a negative effect, on the impact energy of the initial and final cracks of concrete. Moreover, the dynamic strength of concrete was improved with the addition of coal gangue fine or coarse aggregate; the incorporation of coal gangue coarse aggregate made the concrete shear surface smooth; and the given impacting pressure of the concrete with coal gangue coarse aggregate has greater particle breakage.

R. Berenguer et al. present an experimental work related to the partial substitution of Portland cement by sugar cane bagasse in order to reduce clinker in concrete volume, responsible for high emission of CO_2 to the atmosphere. An experimental campaign with cementitious pastes was carried out to evaluate the durability properties' changes due to sugar cane bagasse ash use. The results showed that samples containing 15% of sugar cane bagasse ash unveiled good results in terms of durability, indicating that concrete structure with sugar cane ash research is a new and important scientific topic to be highlighted.

Y. Zhang et al. analyse the mechanical performance of concrete with recycled aggregates from concrete pavements. The experimental results showed that the strength of recycled concrete decreases with increasing water-cement ratio and as the replacement rate of recycled aggregates increases, the optimal sand ratio decreases.

I. H. Yang et al. experimentally analyse the structural behavior of concrete beams containing recycled coarse aggregates. The results showed that the crack pattern of the recycled coarse aggregate beams was similar to that of the natural coarse aggregate beams; however, the recycled coarse aggregate beams exhibited smaller crack spacing than the natural coarse aggregate beams. The flexural strength was marginally affected by the recycled coarse aggregate content; however, the ductility of the beam was not significantly influenced by the recycled coarse aggregate content.

L. Zhu and Z. Zhu present a review of the potential use of waste clay brick as a binder and aggregate substitute in mortar and concrete. The literature review showed that the complete replacement of natural aggregates with recycled clay brick aggregate is feasible and it could reduce the consumption of natural resources and encourage the reuse of construction waste.

Finally, Y. Wang et al. present an experimental study related to the effect of prewetting time and shrinkage reducing agents on shrinkage volume and concrete strength through a series of concrete shrinkage and strength tests. The experimental campaign showed that an appropriate amount of shrinkage reducing agent and adjustment of prewetting time of coal gangue ceramsite are necessary to reduce the shrinkage rate and improve the stability of the specimen. As demonstrated by the authors, this is of great significance to wide application of lightweight aggregate concrete with coal gangue ceramsite.

We hope that readers of this special issue will find not only accurate experimental data and updated reviews on the application of recycled aggregates on concrete structures and elements but also important questions to be resolved. This special issue includes essentially experimental developments, providing a self-contained major reference that is appealing to both the scientists and the engineers. At the same time, these topics will be going to encounter a variety of scientific and engineering disciplines, such as chemical, civil, and agricultural engineering.

Conflicts of Interest

The Editors declare that they have no conflicts of interest.

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