1. Introduction

Green concrete is defined as concrete that uses waste material as at least one of its components, or has a production process that does not lead to environmental destruction, or has a high performance and life cycle sustainability. At present, natural resources are running out. Using industrial and construction waste as raw materials for the production of cement and concrete can be regarded as a valuable resource for civil infrastructure construction. Green concrete will not only contribute to a circular economy but can also help to reduce the amount of embodied energy and CO_2 emissions associated with cement manufacturing, aggregate quarrying and to mitigate the environmental threats associated with industrial waste materials. This Special Issue aims to cover recent advances in the development of green concrete solutions and deliberate on what can best be done to leverage the opportunities. The papers published in this special issue cover theoretical, experimental, applied and modelling studies that research on the materials, products and the structures related to sustainable cement-based composites. The papers are categorized into several representative themes and the main contents of each paper are briefly summarized.

2. Credible Long-Term Performance and Durability

Impact of Temperature Changes and Freeze—Thaw Cycles on the Behaviour of Asphalt Concrete Submerged in Water with Sodium Chloride [1]

This paper studies the mechanical behaviour of an asphalt concrete when it is subjected to temperature changes and freeze–thaw cycles. The results show that, although the temperature changes have a negative effect on the mechanical properties, salt water protects the aggregate-binder adhesive, maintains the mechanical strength, increases the number of load cycles for any strain range and reduces the time that the mixture is in contact with frozen water.

MSWI Bottom Ash Application to Resist Sulfate Attack on Concrete [2]

This research provides a strategy for partially replacing cement with municipal solid waste incineration (MSWI) bottom ash (BA) to improve the performance of concrete against sulphate attack. The results show that the replacement of cement with BA can improve the durability of concrete and actualize the utilization of MSWI residues as a resource.

Thermal and Mechanical Properties of Cement Mortar Composite Containing Recycled Expanded Glass Aggregate and Nano Titanium Dioxide [3]

This paper aims to investigate the effects of recycled expanded glass aggregates (EGA) on fresh and hardened properties and the thermal insulating performance of cement mortar. The results demonstrate that EGA-mortar can be integrated into the building envelop or non-load-bearing-elements, such as wall partition as a thermal resistance, to reduce the long-term energy consumption in residential buildings.
3. Proven Structural Reliability

Experimental Study on the Seismic Performance of Recycled Concrete Hollow Block Masonry Walls [4]

This paper aims to manufacture a new recycled concrete hollow block (RCHB) which can be used for masonry structure with seismic requirements. The influences of the aspect ratio, vertical axial stress and the different materials used for structural columns on the seismic performance of RCHB masonry walls were studied. The research confirms that RCHB masonry walls could meet the seismic requirements through thoughtful design.

Experimental Study on Seismic Behavior of Steel Frames with Infilled Recycled Aggregate Concrete Shear Walls [5]

Experiments were performed on four specimens of steel frames with infilled recycled aggregate concrete shear walls (SFIRACSWs), one specimen of infilled ordinary concrete wall as well as one pure-steel frame and were conducted under horizontal low cyclic loading. The main seismic performance indexes of SFIRACSWs are evaluated comprehensively, providing a theoretical basis for popularizing and applying SFIRACSWs in practical engineering.

4. Reliable Numerical and Modelling Studies

An Experimental Strain-Based Study on the Working State of Husk Mortar Wallboards with Openings [6]

This paper tested full-scale HMES wallboards with different openings and obtained the strains at points distributed on the wallboard sides. An empirical relationship among the experimental failure loads of the wallboards was derived based on the failure characteristics of the wallboards, which could provide a reference to the accurate prediction of the wallboards’ load-bearing capacity.

Numerical Study of Bond Slip between Section Steel and Recycled Aggregate Concrete with Full Replacement Ratio [7]

In this paper, the bond deterioration mechanism of recycled aggregate concrete (RAC) with a full replacement ratio was studied through experimental and numerical simulations. The analysis of the results showed that the developed model is capable of representing the characteristic bond strength value between section steel and RAC with sufficient accuracy.

Experimental Study on a Prediction Model of the Shrinkage and Creep of Recycled Aggregate Concrete [8]

In this paper, 180-day shrinkage and creep tests of recycled aggregate concrete with different water–cement ratios were designed in order to analyse the effect of the substitution rate and water–cement ratio on the shrinkage and creep properties. Moreover, the shrinkage and creep models of the recycled aggregate concrete were established.

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