Preparation and Optimization of Low-Strength Recycled Coarse Aggregate Concrete Based on Response Surface Methodology

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Abstract

This study explores the preparation and optimization of low-strength recycled coarse aggregate concrete using Response Surface Methodology (RSM). With the massive global generation of construction waste, it has become a pressing environmental issue for many countries. Numerous nations are actively seeking ways to recycle construction waste to reduce dependency on natural resources and minimize environmental pollution. In this context, this study begins by testing the basic properties of recycled coarse aggregates derived from construction waste. Through single-factor experiments, the key factors influencing concrete performance and their optimal variation ranges were identified. Subsequently, RSM was employed to optimize the mix design of recycled coarse aggregate concrete, considering the coupling effects between materials. Additionally, by modifying the recycled coarse aggregates, the mechanical properties of the concrete were further enhanced, improving its recyclability. This research provides scientific and technical support for the resourceful utilization of construction waste and the establishment of a closed-loop recycling system.

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