Enhancing the Competence of the Artificial Stone

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Artificial stone (AS) is produced through hydration reactions of a mixture of white cement, aggregates, additives and water. AS is used as an alternative material of natural stone for economic and environmental purposes. Existing industrial formulations of AS are based on typical cementitious mix designs. There is a need for improving the strength and waterproofing characteristics of AS using innovative formulations and additives. Sodium silicate and other waterproofing treatments are widely applied in traditional concrete construction for durability purposes. Sodium silicate was never used in the formulations of AS. The main research problem is investigating the effects of using sodium silicate on density, strength and water absorption of the AS, which are main competence parameters. The research methodology was based on experimental work. This involved mixing, casting, applying sodium silicate as penetrating surface treatment or dosed material, and testing cured AS specimens in the laboratory. The findings of this work indicate that sodium silicate can be used as a surface treatment or as an additive in the formulation of the AS, at a dosage of 2% of cement weight. The proposed design modification increases the compressive strength and decreases the water absorption, without a significant effect on the density. Based on the so far implemented experiments, the best approach is achievable using surface treatment with 4 times brushing onto fresh AS, which leads to 62.6% reduction in water absorption and about 18% enhancement in the strength. This approach would enhance the product durability and increase its competence in the market.

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