

Effects of activated carbon on the compressive strength and air content of Portland cement concrete

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ABSTRACT

In this study, a series of experimental tests were performed to evaluate the effects of activated carbon on the compressive strength and air content of Portland Cement Concrete (PCC). Activated carbon/PCC composites were prepared by mixing concrete components with activated carbon granules with the weight fractions of 0.5%, 1%, and 2% to cement. All PCC specimens were then tested for compressive strength on 7, 14, 21, and 28 days. The experimental results show that adding 0.5% of activated carbon increased the compressive strength significantly over the curing periods compared to the normal PCC without activated carbon. For example, the 7-day compressive strength increased by 28.7%, the 14-day strength by 22.2%, the 21-day strength by 26.8%, and the 28-day strength by 22.9%. However, adding excessive amounts of activated carbon of more than 1% have a minimal effect or even decreased the compressive strength. A similar trend was found in our previous study with cement composites [1]. In the previous study, adding a small amount of activated carbon (≤ 1.5 wt%) that was produced from the waste coffee ground increased the compressive strength of normal cement mortar but larger amounts decreased the strength significantly. Regarding the air contents of the mixtures, adding activated carbon decreased the air content from 3.6% to around 1.5%. However, it was found that excess amounts of activated carbon minimally affect the air content of PCC. In summary, activated carbon has the potential to increase the compressive strength of traditional PCC as a new class of additives.

REFERENCES

Na, S., Lee, S.. and Youn, S. (2021), "Experiment on activated carbon manufactured from waste coffee grounds on the compressive strength of cement mortars", *Symmetry*, **13**, 619.

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