

Yoshida Award: Research Paper Category

Study on Evaluation Method of CO₂ Absorption and Physical Properties of Cementitious Materials with Carbonation Curing

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With Japan making efforts to achieve a carbon neutral society by 2050, the development of technologies for CO₂ reduction is urgent. Active discussion of the issue is under way in the concrete engineering field, with fixing of CO₂ by the carbonation of concrete considered one of the key technologies.

This paper reveals, through a review of past research, that there is no definitive method of quantitatively evaluating the amount of CO₂ fixed by concrete carbonation. To investigate this question, cement pastes formulated with various admixtures were carbonated at high CO₂ concentrations from an early age. The amount of fixed CO₂ was then quantitatively evaluated using various analysis methods. The results demonstrated a tendency for inorganic carbon analysis to give higher estimates of fixed CO₂ compared with thermal analysis, which is generally used. A multifaceted analysis and evaluation of the results was also carried out. A further finding of the work is that over 100 kg of CO₂ can be fixed per cubic meter of concrete using a three-component cement consisting of ordinary Portland cement, blast furnace slag and γ -2CaO·SiO₂.

The paper presents a number of useful and practical findings on the quantitative evaluation of CO₂ fixing by the carbonation reaction and is expected to significantly contribute to the concrete industry becoming carbon neutral in the future.

For the above reasons, this paper is recognized as being a worthy recipient of the Yoshida Award in the Research Paper Category.