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Chloride Migration in Recycled Aggregate Concrete

*Boksun Kim[1)], Mahmoud Hussain[2)], Mark Price[3)] and Lixuan Mao[4)]

[1), 2), 3)] *School of Engineering, Computing and Mathematics, University of Plymouth, PL4 8AA, UK*
[1)] boksun.kim@plymouth.ac.uk

ABSTRACT

The application of recycled aggregates in concrete is gaining popularity in the construction industry due to the numerous environmental and economic benefits. However, one of the drawbacks of recycled aggregates is their low quality because there are two interfacial transition zones (ITZs), one between the new mortar matrix and the recycled concrete aggregate (RCA), and the other between the RCA and the old mortar. These two ITZs make concrete even more porous.

This paper discusses experimental work on the chloride penetration resistance of concrete, incorporating 25%, 50%, 75% and 100% recycled aggregates by weight of coarse aggregates, along with numerical modelling of chloride migration using COMSOL.

A total of sixty samples were prepared at the Materials Laboratory at the University of Plymouth. Six 100mm cubes and six 100x200mm cylinders were cast for each batch. Rapid chloride migration tests were conducted at 28 days after casting to measure chloride penetration, along with the compressive and tensile strength tests.

The results showed that compared with the control samples, the chloride migration coefficient increased by 59% when 100% recycled aggregates were used. This shows the critical importance of quality control when using recycled aggregates. The results are compared with numerical analysis using COMSOL Multiphysics. The effect of recycled aggregates on the mechanical properties of concrete is also discussed.

(a) Vacuum chamber

(b) Samples placed in reservoir

(c) Measuring penetration

Fig. 1 Rapid chloride migration test

[1)] Associate Professor
[2)] Formerly BEng Student
[3)] Senior Technician
[4)] Formerly PhD Student