SURFACE TREATMENTS OF RECYCLED BRICK AGGREGATE AND THEIR INFLUENCE ON SELECTED PROPERTIES OF CONCRETE

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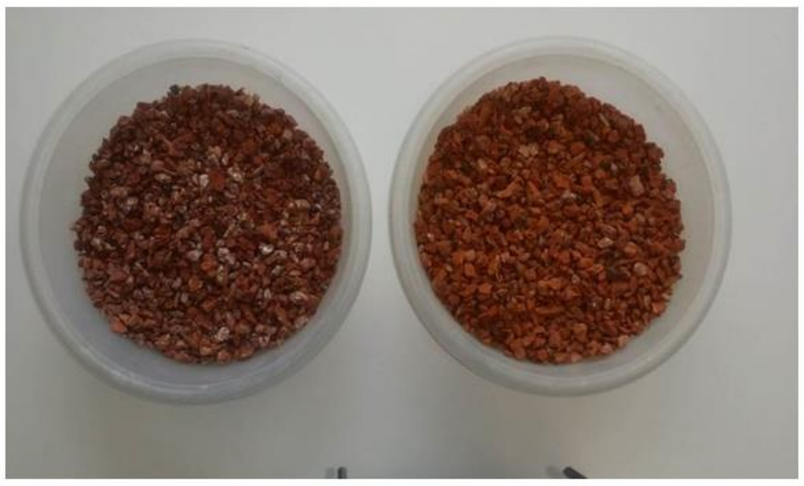
The paper is devoted to surface treatment of recycled brick aggregate with various impregnating substances in order to reduce its absorbency and verify the use of such treated recycled material as a partial replacement of natural aggregate (fraction 4/8) in concrete. Selected properties of the tested samples were monitored after 28 and 60 days of curing. The results show that the treatment of recycled bricks with water glass appears to be a less suitable alternative compared to the use of a hydrophobic solution of silanes and siloxanes.

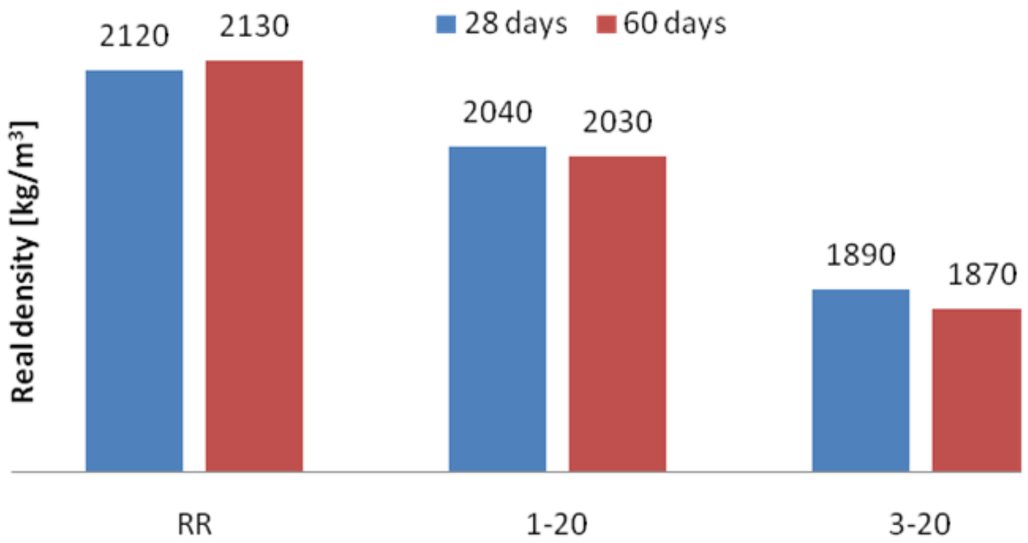
Properties of starting and treated aggregates

The treatment of the recycled brick aggregate itself consisted in being placed in a bath with an impregnator (water glass or hydrophobizing solution) for 48 hours. After a set time, the drying process was followed at room temperature of 20 ºC for 48 hours. The recyclate was stirred regularly to dry as well as possible.

Properties	Natural aggregate 0/4 mm	RBA 4/8mm	RBA 4/8 mm (1. treatment)	RBA 4/8 mm (2. treatment)
Real density [kg/m^3]	2650	1560	2080	1830
Water absorption [%]	5,3	25	3	9



Real density

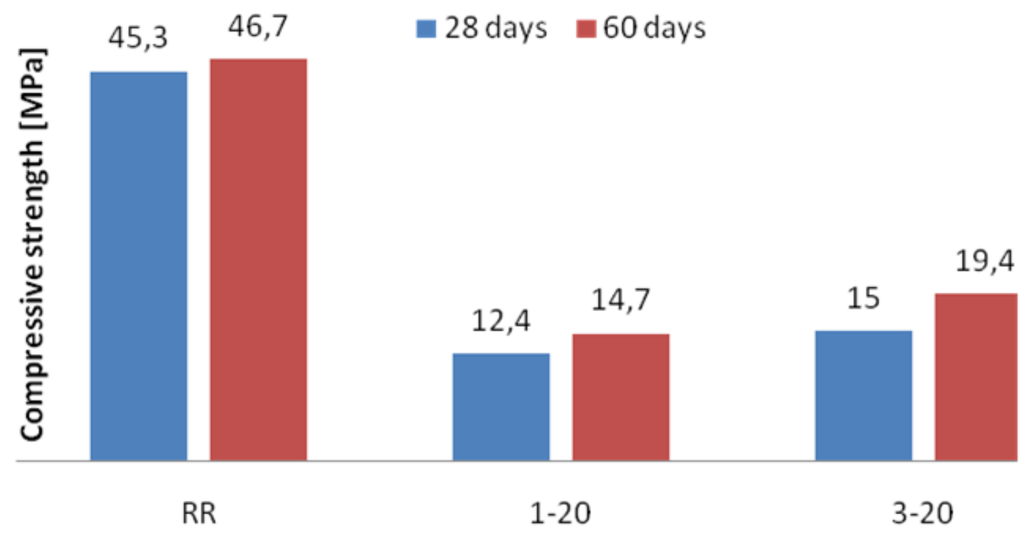


According to the achieved real densities of all test specimens, we can state that the reference sample together with the first treatment of recycled aggregate (sample 1-20), which water glass was used as an impregnator, can be classify it into the class of normal concrete (2000 - 2800 kg/m^3). In the tested sample with the second modification of the recycled aggregate (sample 3-20), a significantly lower real density was obtained, of less than 2000 kg/m^3 (lightweight concrete).

Composition of experimental mixtures per m^3

Composition/Mixture	RR	1-20	3-20
CEM I 42.5 R [kg]	370	370	370
Water [kg]	180	180	180
NA 0/4 mm [kg]	1100	1100	1100
RBA 4/8 mm [kg]	425	594	523
BERAMENT HT 25-1[kg]	2.2	2.2	2.2
w/c [-]	0.49	0.49	0.49

Compressive strength



The final strength was affected by the ratio of recycled and the amount of cement. Sample 1-20 showed the lowest strengths, where the largest amount of recycled brick aggregate was used. The reduced strength of concretes could be caused by the inappropriate development of interaction with the cement matrix in the concrete, resp. due to the relatively high absorbency of the treated recycled brick, which was not taken into account in the production of concrete samples.

Types of experimental samples

From the raw materials described above, fresh concrete mixtures were prepared, which were filled into molds with an edge of 100 mm. The molds were vibrated and left for 24h under laboratory conditions. After demolding, the samples were placed in the water. The real density and especially the compressive strength were monitored on the experimental samples in two time intervals, 28 and 60 days of hardening.

The options we have chosen to eliminate the water absorption of RBA have proved to be ineffective. From the experiment it can be concluded that increasing the amount of RBA based on the real bulk density and the same amount of cement (1 m^3) is at the expense of the resulting strength of concrete. In any case, the water absorption of the recyclates must be taken into account and the required amount of mixing water must be added to the mixture. Untreated RBA appears to be the best option for partial replacement of aggregates compared to treated material. Of the treated RBA, the recyclate achieved better final properties, where a hydrophobic solution of silanes and siloxanes was used as an impregnator. RBA treated with water glass seems to be the least suitable treatment alternative, which showed very poor properties of hardened concrete samples in all tests.

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