RHA를 이용한 황토블럭의 특성 개성에 관한 연구

Improving properties of ocher block by RHA

황경아* 이승걸* 채철호* 구엔닌투이** 이두안** 권혁문***

Hoang, Kieu Nga Lee, Seung Geul Chae, Chul Ho Ng., N. Thuy Le, A. Tuan Kwon, Hyug Moon

ABSTRACT

Ocher block has started to be studied recently as a new environment friendly alternative building material. This article investigates the use of Rice Husk Ask (RHA) as an additive to improve properties of the ocher block. Ocher mixtures incorporating various proportions of RHA were compared. Compressive strength at various ages of these ocher blocks was evaluated ad the resistance to wet environment was also examined. These test result help to determine the effect of RHA on such properties of the ocher block as compaction, mix proportion, compressive strength and water absorption indexes. Based on these results, the new alternative building material and low cost construction techniques might be developed through more intensive research efforts.

***Keywords**: Rice Husk Ash (RHA), ocher block.*

1. Introduction

"Cost-effective building technology and environment friendly material" now attracts the attention of everybody. It can be defined as a method of making building by using the most locally available resources as possible of both human and building material. "Cost-effective" housing replacing "low-cost" one implies the act of building that optimizes the use of appropriate materials and technologies without reducing the quality of products. Therefore, the need of the hour is replacement of costly and scarce conventional building materials by innovative, cost effective and

* 정회원, 영남대학교 토목공학과 석사과정

** 정회원, 영남대학교 토목공학과 박사과정

*** 정회원, 영남대학교 토목공학과 교수

environment friendly alternate building materials. The new material should be environment friendly and preferably utilize industrial/agro wastes because as a result of rapid industrialization, the generation of wastes has increased several folds during the last few years, which needs to be utilized/disposed safely on priority. Rice Husk Ash, an agro-waste material, produced in about 100 million of tons, is now on researched for lime-pozzolan admixture in manufacture the Ocher block.

Rice Husk Ash is a good super-pozzolan material with high silica content of above 75-85% and high specific surface. It maybe useful to improve the strength of ocher block with lime. Silica is a main mineral of Rice Husk Ash. When reacted with lime, it is predicted to form a bonded gel [$Ca(SiO)_3$].

2. Experiment

2.1. Materials

In this research, there are five kind of materials was used: soil of weather granite (WG), east ocher (EO), binder (B), lime (L) and RHA

2.2. Mix proportions and compressive strength

Table 1. Mix proportions, compressive strength and water absorption of ocher

Series	Materials (%)			Admixtures (%)		Compacting force (Mpa)	Compressive strength (MPa)			Water absorption (%)
	WG	B	EO	L	RHA		3 days	7 days	14 days	14 days
I-1	48	30	22	0	0	25	11.36	22.28	24.71	6.00
I-2	48	30	22	1	1	25	11.67	24.35	26.44	5.24
I-3	48	30	22	3	3	25	14.52	29.84	31.90	4.96
I-4	48	30	22	5	5	25	11.53	23.54	25.20	5.33
I-5	48	30	22	7	7	25	9.3	20.71	21.10	6.11
II-1	48	30	22	3	3	15	6.86	14.60	15.54	7.10
II -2	48	30	22	3	3	20	7.50	17.30	18.64	6.14
II -3	48	30	22	3	3	25	10.72	22.80	23.80	5.01

The water ratio is 10% for specimen made with compressing method

The ratio between Lime and RHA is 1:1

2.3. Results and discussion

In this research, we used KS F 2329 to make the specimen for compression test. The specimens were made in cylinder shape 50 mm diameter and 100 mm height for compressive strength and water absorption.

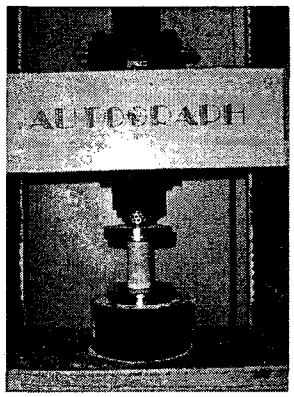

Fig. 1 Test machine and specimen type

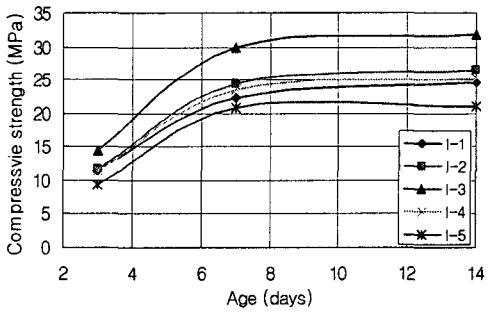

Fig. 2 Compressive strength of series I due to curing age

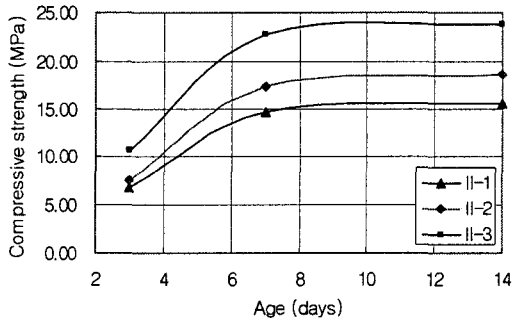

Fig. 3 Compressive strength of series II due to curing age

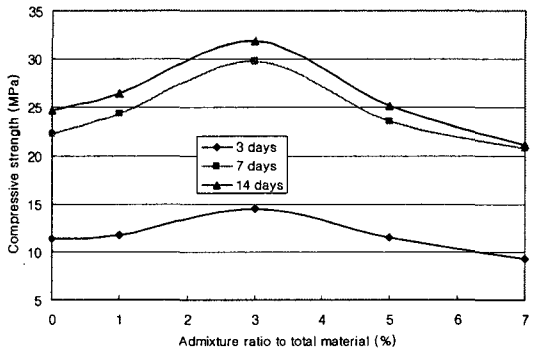

Fig. 4 The relationship between compressive strength and RHA ratio

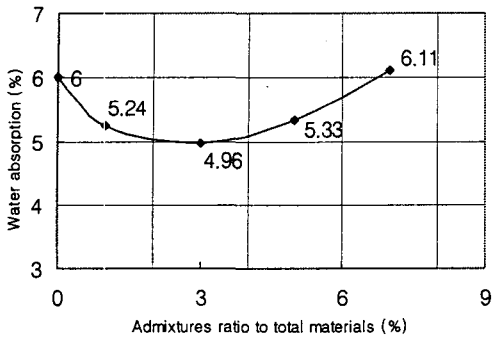

Fig. 5 Water absorption of series I with different admixture ratio

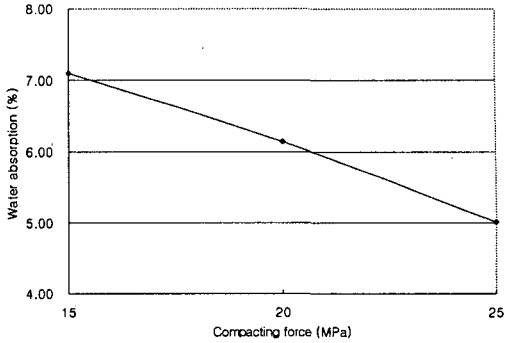

Fig. 6 Water absorption of series II with different compacting force

When the ratio of admixture Lime and RHA are changed, the compressive strength of the specimen also vary. If the admixture ratio is increased more than 3%, the compressive strength will be reduced. Therefore, the compacting force affects on the compressive strength of the specimen when the compacting force is higher the compressive strength increases as well as the water absorption is decreased because the material is more condensed. The results of those experiments can please the KS L 4201-1997.

Table 2. Compressive strength of clay bricks (KS L 4201-1997)

Kind of clay bricks	Type 1	Type 2	Type 3
Compressive strength (MPa)	20.59	15.69	10.78

3. Conclusion

- The strength of ocher with the good mix proportion can be made unburnt bricks.
- The compressive strength of ocher bricks is highest with 3% lime and RHA.
- The compressive strength of ocher will be decreased if used the admixture ratio more than 3%.
- The water absorption is decreased if used the admixture ratio more than 3%.

Reference

1. 한국산업규격 KS F 2329, KS L 4201

2. ASTM D2166-00, p. 202-207