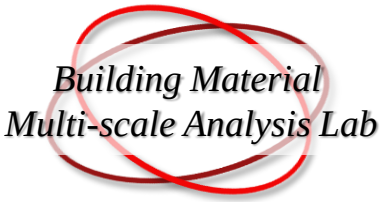
One month's activities

Practice for Korea-Japan Symposium presentation



○ Kaishi Kojima (Muroran Institute of Technology, Japan)

One month schedule

SUN	MON	TUE	WED	THU	FRI	SAT
7/9	/10	/11	/12	/13	/14	/15
	Response to peer review of CBM paper					
/16	/17	/18	/19	/20	/21	/22
	Assistance with concrete experiments					
/23	/24	/25	26	/27	/28	/29
	Assistance with concrete experiments & Make PPT for Japan-Korea symposium					
/30	/31	8/1	/2	/3	/4	/5
	Assistance with concrete experiments & Practice presentations for Japan-Korea symposium					
/6	/7	/8	/9	/10	/11	/12
	PICLs and Japan-Korea symposium					

One month's activities -7/10~7/15-

Response to peer review of CBM paper

Answer Sheet

Manuscript Number: Construction and Building Materials

Title: Study of microstructural changes in blast-furnace cement hardened by repeated dry and wet curing at high temperatures

Author's Reply to the Review Report (Reviewer 3)

Comments and Suggestions for Authors:

In this paper, the microstructure changes of ordinary cement and hardened blast furnace slag cement with different C-S-H compositions were studied during high-temperature dry-wet cycles, and the changes in moisture and pore structure in hardened cement were analyzed. This research has contributed to the application of hardened cement, but many things could be improved in this paper, including a crucial one. Careful consideration, it is not recommended to publish in this journal.:

→: We would like to thank the reviewer for carefully reading and for giving quite valuable comments and suggestions, which substantially helped improving the quality of this manuscript.

Specific comments:

1.The format of the reference should be in accordance with the requirements of the journal, and for example, the reference superscript should be [1] rather than 1).

→We thank the reviewer for comments. Corrected [1] how to cite references in the manuscript.

2.The first line of the paragraph should be indented by two characters, and it is recommended to modify it.

→We thank the reviewer for comments. The first paragraph of the manuscript has been revised to be

Revised manuscript with changes marked Click here to view linked References

4.The expression in Figure 14 is not clear, and it is recommended to draw according to Figure 4 and mark the specific value.

→We thank the reviewer for comments. We revised the figure in response to the comments, along with the comments of the other reviewers.

The following is the revised figure.

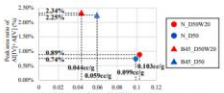


Fig. 16 Relationship between Al[IV] & Al[V] and cumulative pore size from 30-10000 nm

5.In section 3.5, "N_4w_ettringite: 30.8%, monosulfate: 41.7%, B45_4w_ethringite: 4.8%, and monosulfate: 48.3%" should indicate the source of the data.

→We apologize for our mistake. We apologize, these values showed incorrect values. We will correct them to the correct values. We also add a table (Table 5 ^{27}Al MAS NMR relative peak area percentages (%)) with the peak area ratio values for ^{27}Al MAS NMR because Figure 13 (Figure 15 after correction) does not have numerical data written in the same way as Figure 4 (Figure 6 after correction).

The revised manuscript and the added table are listed as follows.

Added manuscript: The numerical data for the peak area ratio of the ^{27}Al MAS NMR is shown in Table 5.

Table 5 ^{27}Al MAS NMR relative peak area percentages (%)

	N	

Study of microstructural changes in blast-furnace cement hardened by repeated dry and wet curing at high temperatures

Kaishi Kojima Jihoon Kim Ryoma Kitagaki Yukio Hama

Abstract: In ordinary hardened cement, the pore structure changes with microstructural changes due to repeated dry and wet cycles. However, the calcium-silicate-hydrate (C-S-H) produced in blended cement is different from that of ordinary cement because blast furnace slag and fly ash are used in blended cement. In this study, microstructural changes in ordinary cement and hardened blast-furnace cement, which have different compositions of C-S-H, due to repeated dry and wet cycles at high temperatures, were analyzed by solid-state nuclear magnetic resonance (NMR) for structural changes in the products, and by time domain NMR and mercury intrusion porosimetry for changes in moisture and pore structure in the hardened cement. As a result, it was confirmed that the degree of coarsening of capillary porosity in blast-furnace cement was lower than in ordinary cement due to drying and repeated dry-wet cycles. This is believed to be because the aluminum contained in the blast furnace slag of the blast-furnace cement, which is present in the interlayer, improves the resistance of the C-S-H layer to compaction, resulting in less change in the pore structure. This study is expected to contribute to fundamental research on hardened cement in the future.

Keywords: Blast furnace slag cement, Repeated dry and wet, C-A-S-H, Microstructure, Pore Structure, Solid State NMR, time domain NMR, ^{1}H NMR

1. Introduction

Concrete is a building material commonly used in construction. However, its physical properties vary greatly depending on the type of cement used and the hydrates produced [1-3]. In addition, cement hydrates are formed by complex interactions, and the microstructure of cement hydrates is constantly changing. Among them more than half of the total hydrate volume is formed as calcium-silicate-hydrate (C-S-H). C-S-H is easily affected by external factors, such as temperature and humidity variations during curing, which causes the microstructure of C-S-H to change [4-8]. This change affects the pore structure inside the hardened material and alters its physical properties [9,10].

In addition, concrete structures under real conditions are affected by temperature and humidity variations due to repeated dry and wet conditions [11-14], resulting in deterioration of the concrete surface. It has been shown that pore structure is a major factor in neutralization and frost damage, which are the main causes of concrete deterioration. Kamada et al. [15] investigated the relationship

Construction and Building Materials

Study of microstructural changes in blast-furnace cement hardened by repeated dry and wet curing at high temperatures

--Manuscript Draft--

Manuscript Number:	CONBUILDMAT-D-23-04840R1
Article Type:	Research Paper
Keywords:	Blast furnace slag cement; Repeated dry and wet; C-A-S-H; Microstructure; Pore structure; Solid State NMR; time domain NMR; ^{1}H NMR
Corresponding Author:	Jihoon Kim, Ph.D. Muroran Institute of Technology Muroran, Hokkaido, JAPAN
First Author:	Kaishi Kojima
Order of Authors:	Kaishi Kojima Jihoon Kim, Ph.D. Ryoma Kitagaki Yukio Hama
Abstract:	In ordinary hardened cement, the pore structure changes with microstructural changes due to repeated dry and wet cycles. However, the calcium-silicate-hydrate (C-S-H) produced in blended cement is different from that of ordinary cement because blast furnace slag and fly ash are used in blended cement. In this study, microstructural changes in ordinary cement and hardened blast-furnace cement, which have different compositions of C-S-H, due to repeated dry and wet cycles at high temperatures, were analyzed by solid-state nuclear magnetic resonance (NMR) for structural changes in the products, and by time domain NMR and mercury intrusion porosimetry for changes in moisture and pore structure in the hardened cement. As a result, it was confirmed that the degree of coarsening of capillary porosity in blast-furnace cement was lower than in ordinary cement due to drying and repeated dry-wet cycles. This is believed to be because the aluminum contained in the blast furnace slag of the blast-furnace cement, which is present in the interlayer, improves the resistance of the C-S-H layer to compaction, resulting in less change in the pore structure. This study is expected to contribute to fundamental research on hardened cement in the future.
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The coment of No. 1 should be revised to ～～.

I understand.
I will revise ～～ to ××.

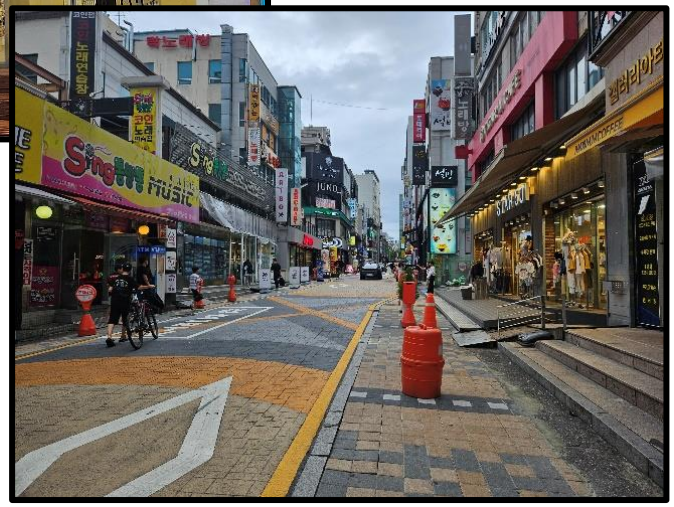
Meetings using ZOOM

One month's activities -7/16~7/22-

Assistance with concrete experiments

↓Help with carbonation test

↓shopping in Deajeon



One month's activities -7/23~7/29-

Assistance with concrete experiments
& Make PPT for Japan-Korea symposium

↑Seoul

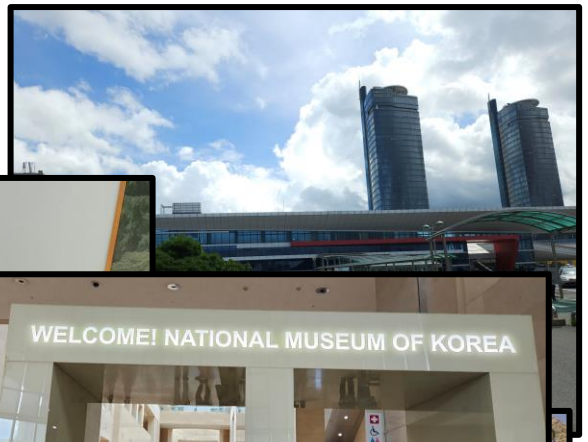
↑chloride test

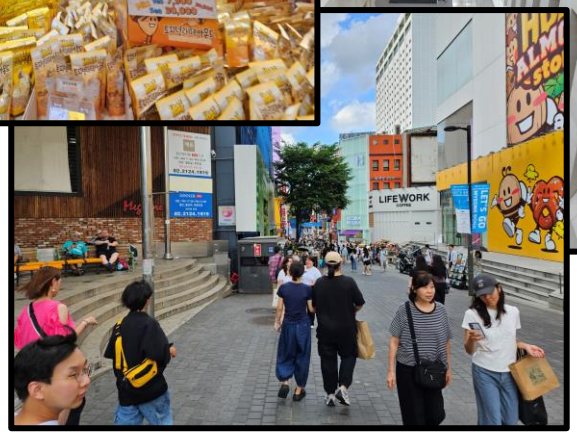
↑hot spa

One month's activities -7/26-

Seoul tourism

- 10:00 Laboratory set
- 12:30 Arrive at Seo
- 13:00 Lunch time
- 14:00 National Muse
- 15:30 Shopping in Myeongdong

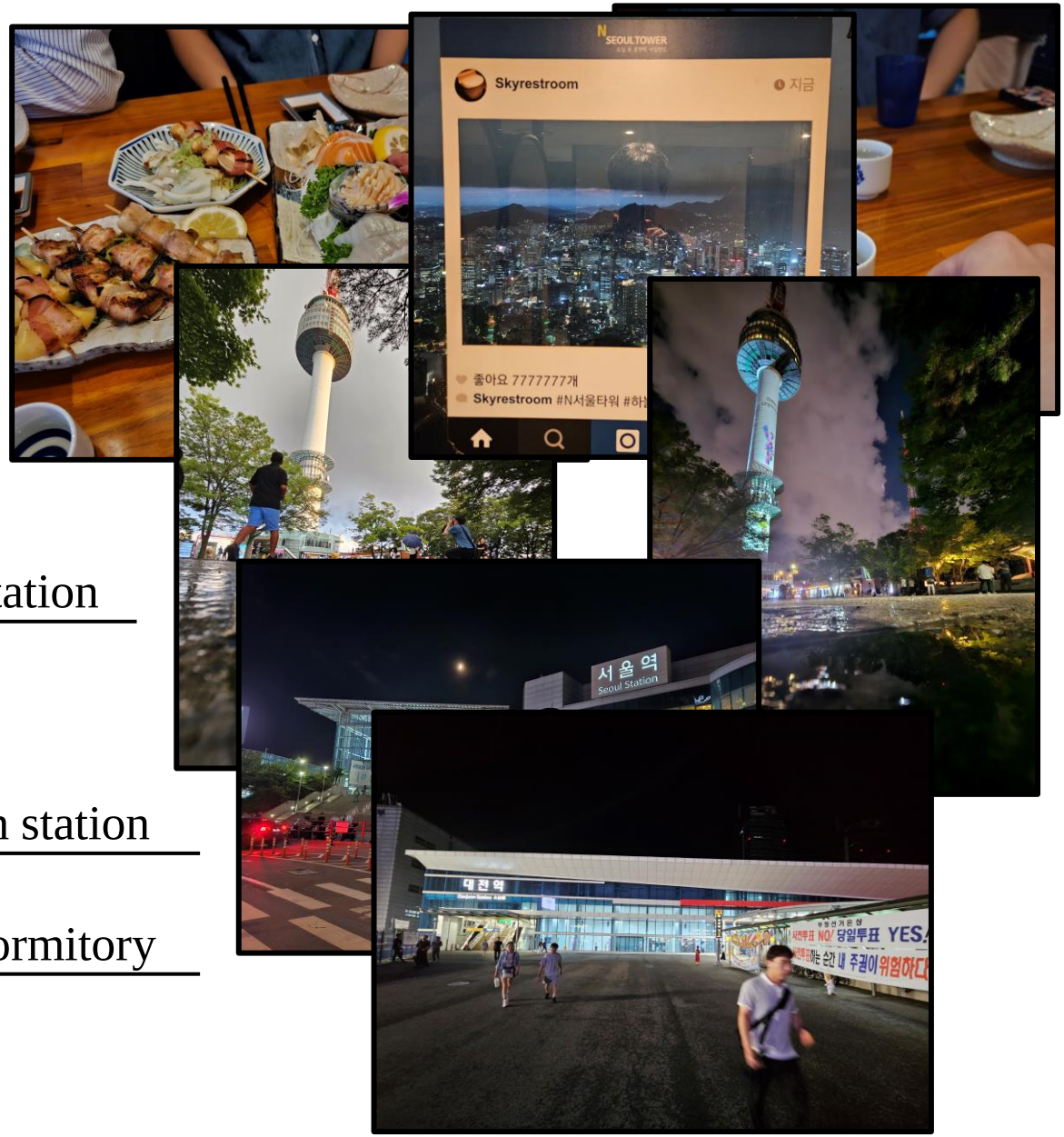




One month's activities -7/26-

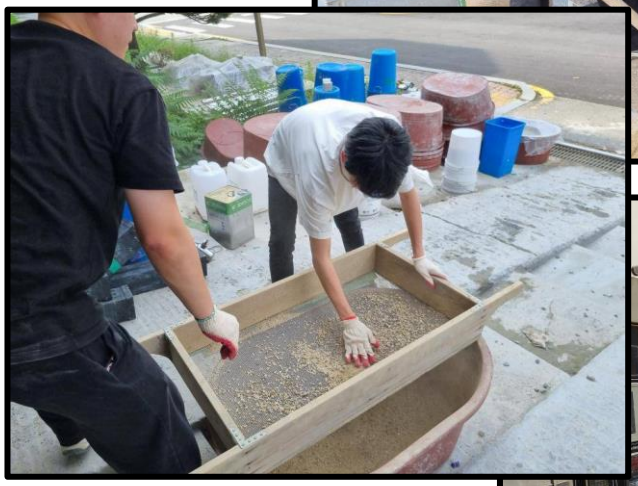
Seoul tourism

- 17:00 Dinner time
- 18:30 N Seoul tower
- 21:00 Arrive at Seoul station
- 23:00 Arrive at Daejeon station
- 23:30 Arrive at CNU dormitory



One month's activities -7/31~8/2-

Assistance with concrete experiments
& Practice presentations for Japan-Korea symposium



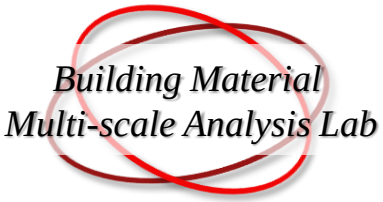
↑Preparation of fine aggregate

↑mixing geopolymer

↑Cutting specimen

One month's activities

Practice for Korea-Japan Symposium presentation



○ Kaishi Kojima (Muroran Institute of Technology, Japan)