

Research Trip Summary Report

Task 2. Foreign mobility of WUST doctoral students

I. Data of the doctoral student

1. Full name: Jeonghyun Kim
2. Year of studies: 3rd year
3. Educational discipline: Civil Engineering and Transport

II. Foreign research trip (research visit)

1. Research institute in which the foreign research was implemented: Hongik University
2. Name and surname of the host person (mentor): Prof. dr. Sungchul Yang
3. Dates of the research trip: July 28, 2022 - August 27, 2022 (1 month)

4. Title and date of a seminar delivered during the research trip: Seeking true sustainable development of construction waste as a supplementary cementitious material, August 16, 2022.

5. Description of work carried out during the research trip:

The feasibility of repeated recycling of waste concrete was investigated. Through a series of concrete casting and crushing processes, recycled aggregate and recycled powder used three times were obtained, and various cement composites made of the repeatedly-recycled waste powder were prepared and their properties were evaluated:

- The specific gravity and water absorption for repeatedly-recycled aggregate were investigated. Specific gravity, chemical composition by XRF, thermal gravimetric analysis, and particle size of the repeatedly-recycled powder were investigated.

- The mechanical strength, drying shrinkage, and water absorption characteristics of cement composites blended with the repeatedly-recycled powders were investigated.

6. Description of the main results obtained:

The results obtained during the one-month research stay showed that the properties of the cement composites deteriorated as the number of recycling of the recycled material increased.

- As the number of recycling increases, the quality of recycled aggregate degraded, i.e. high water absorption and low density.

- In addition, the density of the recycled waste powder decreased and the chemical properties changed with the increasing number of recycling.

- The mechanical strength of the cement composites decreased as the replacement ratio of cement by the recycled powder increased. However, the degree of property reduction caused by the multiple recycling was negligible until the second recycling.

- When the replacement ratio was increased, the rigidity of the cement composite decreased, making it sensitive to drying shrinkage. However, drying shrinkage due to multiple recycling does not show a pronounced tendency.

Based on the experimental results of the research, a scientific article is being prepared.

7. Future collaborations (if applicable):

As can be seen from the general experimental results reported in the previous section, it was shown that the performance of cement composites containing repeatedly-recycled powders deteriorated, and future research for improving and improving properties may be a future collaboration.

8. Title and date of a seminar presenting the results of the trip delivered at Wrocław University of Science and Technology after returning from the research trip:

Properties of multi-recycled waste powder as a partial cement replacement, 23rd September 2022.

III. Doctoral student's signature

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(Date)

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(doctoral student's signature)

IV. Confirmation and information from the host

1. Confirmation of compliance of the information contained in the report: **I CONFIRM** / ~~DO NOT CONFIRM~~. (In justified cases, the confirmation of the host may be sent by e-mail to the Dean's Office of the Doctoral School email: interdocschool@pwr.edu.pl)



2. Additional information and comments

Mr. Jeonghyun Kim actively conducted research within a given period, and the topic of multiple recycling of construction waste is important to today's social and environmental needs. Based on the results of this study, we look forward to further joint research in the near future.

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(Date)

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(signature(s) of Host)