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道路用路盤材に用いる鉄鋼スラグの水和反応と硬化作用
Hydration and hardening prcess of iron and steel slags used for roadbed material

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Steel slag is a by-product of the steel manufacturing process and produced in large quantities every year. Steel slag is expected to reuse in Japan. However, it was observed that the uniaxial compressive strength (UCS) differs among mixed slag for roadbed materials produced from different factories including even with the same mixing ratio of DCS and GBFS. In particular, the difference between the UCS of slag produced from K ironworks and N ironworks was remarkable. The reason for these differences has not yet been clarified. To extend the market of steel slag, it is essential to clarify the relationship between secondary minerals formed after hydration and the UCS of the slag.

This study firstly investigated the UCS of the MIX slag (DCS / GBFS = 4) from K ironworks and N ironworks. Based on the UCS tests, the slag from N ironworks is stronger than the slag from K ironworks.

Batch experiments were then conducted for samples from K ironworks and N ironworks to investigate and compare the evolution of solution chemistry and precipitation of secondary minerals during slag hydration. Based on the XRD analysis for the samples after the batch experiments, the main product of the MIX sample from K ironworks is αC_2SH while the MIX sample from N ironworks produced mainly CSH. The difference in mineralogy could be related to the UCS of the slag because of the difference in volume of secondary minerals. Based on the solution analysis of the samples, it is observed that the main source of Ca ion is DCS, while the main source of Si ion is GBFS. In addition, it is possible that the concentration of H_4SiO_4 in the solution, which is present in the form of calcium silicate hydrates, is determined by GBFS. Kinetic model was constructed. The model represent the mineral evolution during slag hydration in the both MIX slags.

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