

Abstract of Main Thesis

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Title of Thesis

Physical and chemical properties of aggregates affecting the shrinkage in concrete and eco-concretes

Phonetically in Japanese Hiragana
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Abstract on the Content of the Applicant's Thesis

As time passes, industries are becoming more concerned about the optimization of the resources to preserve the natural sites. At this moment, the cement and concrete industries are generating a huge negative environmental impact with the extraction of natural resources and the pollution generated from its production. Recently, these industries have increased its contribution to the sustainable development, utilizing raw materials considered wastes. Therefore, it is necessary to study these waste materials to increase its usage, diversity and reduce its production cost.

This research deals with the use of some natural aggregates and sewage sludge molten slag aggregate. The molten slag aggregate is produced at the lakeshore of Lake Biwa (the largest lake in Japan) and it avoids the pollution of the lake separating the solid waste from the drainage and the landfill of this sludge. Several physical and chemical tests were carried out to study the different properties of each aggregate. The used binders were Ordinary Portland cement and Eco-cement which is produced majorly from incinerated municipal waste. Several concrete specimens were produced to study its performance and especially their drying shrinkage results. All the results from the different test of aggregates and concretes were related with the results of the drying shrinkage test in order to find a possible relation with their different properties.

The results of the tests in aggregates show a considerable relation between the volume change of the aggregate itself and the drying shrinkage of concrete. Other properties such as water absorption, specific surface area, and shape as not many influence as the volume change. Additionally, the specific surface area and the alite and belite content of cements have a great influence of the drying shrinkage result of any type of concrete.