MECHANICAL PROPERTIES AND CREEP BEHAVIOUR OF AN ALKALI-ACTIVATED CONCRETE

Albina Kostiuchenko, Microlab, Department of Civil Engineering and Geosciences, TU Delft
a.kostiuchenko@tudelft.nl
Jiahua Liu, Jiangsu College of Engineering and Technology
Zainab Aldin, Microlab, Department of Civil Engineering and Geosciences, TU Delft
Bahman Ghiassi, Microlab, Department of Civil Engineering and Geosciences, TU Delft
Guang Ye, Microlab, Department of Civil Engineering and Geosciences, TU Delft

Key Words: Geopolymer, alkali-activated materials, concrete creep, mechanical properties.

Alkali activated materials (AAMs) have received great interest for production of eco-friendly concrete as an alternative for OPC-based concrete. AAMs usually have comparable or better mechanical properties and durability compared to that of OPCs, and at the same time help in reduction of CO_2 emissions and utilization of industrial wastes. In general, AAMs have a high resistance to very high and low temperatures and show a rapid strength gain which makes them an excellent option for rapid construction.

As a potential structural material, AAMs face some obstacles for application in construction including the lack of knowledge on long-term performance and stability as well as the lack of standardized procedures for production and design alkali activated concrete. The problem of control and increase of the material performance is the main challenge for AAMs researchers.

Despite the recent interest and intensive research on the performance of AAMs, the time-dependent deformation and creep of these materials have not been fully investigated yet. The creep phenomenon depends on many environmental (like temperature and humidity) and structural (the mix design and curing conditions) parameters and therefore it is expected have differences in AAMs compared to OPC. In this work, the authors present a preliminary experimental investigation of this phenomenon in concrete made of AAMs. The presented experimental data, including mechanical properties and creep tests results, are a step towards understanding of the creep mechanism in these materials.

The test results shows the increase of compressive strength, splitting strength, and Young's modulus during the first 30 days of curing. From 30^{th} to 90^{th} days, the mechanical properties have insignificant changes. The creep tests are performed for five months. The creep curves are similar to OPC and show a creep coefficient of about 5.5 for total creep and 4 for basic creep.