# BEHAVIOUR OF SHRINKAGE REDUCING ADMIXTURES BASED ON POLYETHER STRUCTURE IN VARIOUS ALKALINE SOLUTIONS

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The several types of alkali activated materials (AAM) are in global research interest for number of previous decades. One of them - alkali activated slag mortars/concretes become attractive due to reduction of the worldwide limestone reserves and rapidly growing carbon taxes[1, 2, 3]. So the development of these materials in large-scale is nowadays substantial.

Granulated blast furnace slag is commonly chosen as a suitable source of latent hydraulicity specie, that can be activated by high alkaline solutions (i.e. NaOH or sodium silicate glass). Although these mortars and concretes possess very durable products with quick strength development and good chemical resistance, the high shrinkage phenomena, drying, autogenous (2 – 4 more times higher than when the ordinary Portland cement is applied), is typically observed[4, 5]. Various type of polymer admixtures are applied to suppress this phenomenon. One of the possible explanation is attributed to capillary stresses resulting from fine pore size of formed hydration products[6]. The usage of admixtures, which can lower the surface tension and influenced the pore structure of formed CASH gels, is offered. The addition of shrinkage reducing admixture (SRA) based on polyether type is intensively studied and showed the interesting results in the shrinkage development suppression. The main research is done on the interaction between the SRA and blast furnace slag particles. The behavior, interactions and stability in alkaline solutions are still not clear.

This work is related to the study of polyethylene glycol and polypropylene glycol based SRA´ behavior in alkaline environment. The polymers (and corresponding monomers) were mixed with different solutions according to pH and ion composition ($H_2O$, NaOH, sodium silicate glass and synthetic pore solution, respectively) with the mass ratio 1:1. The time dependence study was performed on the samples incubated at 25°C in sealed vials. The part of treated samples was separated after 1, 7, 14 and 28 days after mixing and dried for analyses. The Raman and FTIR spectroscopy was used to assess the stability of the chemical structure. The treated samples were also studied in terms of surface tension characterization. Finally, the time dependence reaction has also affected the rheology of solutions, what can extremely influence the workability and casting of final AAS mortars or concretes. So the rheological behavior was examined. The spectra obtained from Raman and FTIR spectroscopy analyses showed the time influence and pointed to ongoing reactions in the high alkaline system. Especially, the rheology behavior was strongly changed within the time and SRA molecular weight from liquid (in case of low weight) to almost solid state (in case of higher ones). The experimental results showed the essential need to study the polyether compound behavior in alkaline environment.

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