The effect of CaO-Al$_2$O$_3$-SiO$_2$ glasses composition on their structure and reactivity in alkali activated system

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The influence of calcium aluminosilicate glass chemical composition on resulting structure and reactivity in ternary systems containing synthetic glass, limestone and alkali has been explored. Chemical compositions of glasses are important especially when concerning chemistry of Portland cement. Seven of them represent variability of chemical composition of siliceous and calcareous fly ash glasses. Comparatively, one glass introduces granulated blast furnace slag glass composition. Fourier transform infrared spectroscopy (FTIR) and Raman spectroscopy were employed to examine the structure of glasses. Reactivity was analyzed on paste samples after 1, 2, 7, 28 and 90 days of curing by means of thermogravimetry (TG), X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR). Spectroscopic results confirm both strong dependence of the structure on the chemical composition of glasses and their reactivity on the degree of polymerization of the glass network. It has been shown that in presented systems Al-rich glasses may exhibit reactivity at levels similar or even higher than Ca-rich glass. This implies that Al present plays not only the role of a network-former but also a modifier when it occurs in higher than tetrahedral coordination.

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