The influence of curing conditions on mechanical strength and porosity of geopolymers

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Geopolymers have been suggested to be used as construction, waste treatment and even drug delivery material due to its excellent mechanical strength, acid resistance and biocompatibility. The aim of this study is to investigate the influence of temperature, time and humidity during curing on mechanical strength and porosity of geopolymers.

The geopolymer was synthesized by mixing metakaolin, waterglass and de-ionized water until a homogenous paste was obtained. The following molar oxide ratio was used: Al₂O₃/SiO₂=0.353, Na₂O/SiO₂=0.202, H₂O/SiO₂=2.977. The paste was molded into cylindrical rubber moulds (6 x 12 mm) and cured under different temperatures (ambient temperature, 37°C and 90°C), humidity and time (24, 48 and 96 hours). The compressive strength was determined using a universal testing machine. Helium pycnometer was used to measure the porosity. Via x-ray diffraction the phase composition of the cured samples was determined.

Higher curing temperature increased the compressive strength after 24 hour but did not affect the strength for longer curing times. In general, the samples cured in moisture had higher mechanical strength than those cured in air. More metakaolin remained in samples cured under high temperature, while for samples cured under low temperature for longer time showed a higher conversion to geopolymer. Curing time did not show much influence on the total porosity.