Effects of modulus of sodium silicate solution on mechanical properties and microstructure of geopolymer

ZHANG Zuhua, YAO Xiao, ZHU Huajun (College of Materials Science and Engineering, Nanjing University of Technology, Nanjing 210009, China)

Four sodium silicate solutions of modulus $m=1.0, 1.2, 1.4$ and $1.6$ were prepared as activators used in metakaolin-based geopolymer synthesis. The effects of modulus of activator on the mechanical properties and microstructure of the geopolymers were studied by strength test, infrared analysis (IR), X-ray diffraction (XRD), and scanning electron microscopy (SEM). Results showed that the most SiO$_4$ tetrahedrals were in low poly-degree status when the modulus varied from 1.0 to 1.6. Compressive strength and flexural strength increased with the curing time. The geopolymer of $m=1.2$ achieved the highest compressive strength at 28 d (74.6 MPa) and its flexural strength was 11.2 MPa. The mineral composition of 4 geopolymers was similarly amorphous, and composed of geopolymeric gels and residual raw particles, while the microstructure of the geopolymer of $m=1.2$ was the smoothest one.

【Key Words】: geopolymer sodium silicate modulus mechanical properties microstructure
【Fund】: 江苏省普通高校博士创新基金资助项目 (CX098_126Z)