

Influence of Particle Size Distribution on the Compressive Strength of Geopolymers Produced from Coal (co-)Combustion Fly Ashes

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ABSTRACT

Certain coal (co)-combustion fly ashes are suitable precursors for geopolymers. From a selection of 18 European coal (co)-combustion ashes, some of the best performing ashes were chosen for particle size separation. A centrifugal zigzag classifier was used to produce batches of fine fractions from the ashes. The feed fly ashes had average particle sizes between 15 and 25 μm (d_{50}) with a d_{10} of about 3 μm and a d_{90} between 60 and 90 μm . The average particle sizes of the produced fine fractions were between 2 and 9 μm with cut sizes (d_{97}) varying from 5 to 30 μm .

The fine fractions separated from the fly ashes may have a different chemical composition and content of reactive glass, as well as a different active surface area, compared to the feed ashes. Besides the particle size, these three factors also will have an influence on the strength of the resulting geopolymers.

Geopolymers were produced incorporating the feed samples as well as the fine fractions in the mixes. The mixes were composed as such that the produced pastes were just workable for the time required to mold enough samples for testing.

Compressive strength of the geopolymers with the feed samples was in the order of 60 to 70 MPa after 28 days. The geopolymers produced with the finest fractions reached compressive strengths after 28 days up to 100 MPa and even higher. The results suggest a relation with particle size.

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