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A mixture proportioning method for the development of performance-based alkali-activated slag-based concrete

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1 **A mixture proportioning method for the development of performance-based alkali-activated**
2 **slag-based concrete**

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8

9 **Abstract**

10 This paper reports a general mixture design procedure for alkali-activated slag concrete, which is
11 an essential step towards industrial application. The procedure involves three steps: 1) the
12 determination of coarse and fine aggregate ratio according to close packing model; 2) the
13 determination of liquid phase (water content and activator) based on compressive strength; and 3)
14 the determination of excess paste content by workability requirement and measurement. Effects of
15 mixture proportional factors, including activator composition, water content, fly ash content, and
16 binder/aggregate ratio are examined on consistency, setting time and compressive strength. The
17 relationship between performance and precursor composition is established using simplex centroid
18 design method. Using the mixture proportioning method, alkali-activated concretes with
19 compressive strength grades of C40, C60, and C80 are successfully prepared with initial setting
20 time of 1 to 3 h and slump of more than 200 mm.
21

22 **Keywords:** alkali-activated concrete; proportional design; simplex centroid design method; slump;
23 setting time; compressive strength
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