Distinct element modeling uniaxial compressive test applied to geopolymeric concrete

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Abstract

In this study, a distinct element model (DEM) of geopolymeric concretes was developed using a particular flow code (PFC) to calculate the uniaxial compressive strength; the concrete has been modeled by an assembly of rigid particles bended together. Then a standard compressive test was carried out to determine the micro-mechanical parameters (i.e. bond strength, contact elastic modulus and friction coefficient between the particles). The results obtained from the DEM model showed that the compressive strength of concrete is highly sensitive to the tensile bond strength of fine particles comprising the concretes.

Keywords: Distinct Element Method, Geopolymeric Concrete, Compressive Strength.

1. Introduction

Geopolymer is an environmentally friendly material that can be used as an alternative to Portland cement in different types of constructions because of its high strength and durability. The alkali-activated geopolymer shows similar mechanical behaviors to those of conventional cement. Geopolymer is produced through chemical reactions between a highly reactive aluminosilicate source and an alkaline solution. The reactions produce a class of inorganic polymer materials with Si-O-Si and Si-O-Al bonds linked together in an amorphous network. [1-3]. In this study, the compressive test applied to geopolymeric concretes has been simulated using distinct element method (DEM) to investigate the effect of the micro mechanical parameters. The DEM was developed for modeling discrete systems simulated by an assemblage of independent units. The individual units can be rock blocks, solid particles of granular materials like concrete, structural elements, or other individual parts or members of multi-body systems [4, 5].