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Processing, properties and applications of highly porous geopolymers: a reviewChengying Bai,^{1,*} Paolo Colombo^{1,2}

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Abstract

Geopolymers, possessing a semi-crystalline three-dimensional inorganic network generated by the dissolution and reaction of a solid alumino-silicate source with an activating solution, have attracted increasing attention from both academia and industry because of their unique and favorable characteristics. This review deals with the synthesis, characterization and potential applications of porous geopolymers, realized through different processing routes. Firstly, the processing approaches are divided into five categories: (i) Direct foaming, (ii) Replica method, (iii) Sacrificial filler method, (iv) Additive manufacturing, and (v) Other methods. Their microstructure, porosity and properties are compared and discussed in relation also to the different processing routes. This review highlights the fact that porous geopolymers are promising low-cost candidates for technologically significant applications such as catalyst supports or membranes, filtration of liquid or gases, adsorption and insulation. This review aims at summarizing the main published results and fostering further investigations into developing innovative ways to generate components with improved properties.

Keywords: geopolymers; foams; porosity; thermal conductivity; strength

1. Introduction

In the 1970s, Davidovits [1,2] initially reported on geopolymers as semi-crystalline 3D

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