ROOM TEMPERATURE FOAMING OF GLASS POWDER IN AQUEOUS ENVIRONMENT

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Foam glass is a cellular material that is used in thermal insulation applications due to its low thermal conductivity. The high crushing resistance, low moisture absorption, high temperature and corrosion resistance of foam glass are considered to be key advantages over polymer and cement based cellular structures that are used in the construction industry. Foam glass technology has been thoroughly documented from both scientific and industrial perspective. Conventional processing of this material utilizes either recycled or chemically controlled glass as its main source of raw material, which is formed into a controlled cellular structure using foaming reactions at high temperatures (typically between 700-1000C) [1, 2]. Different from the conventional production methods, this study has focused the formation and its mechanisms of formation of cellular structures at room temperature conditions using recycled glass as the starting raw material. Foaming was achieved in aqueous suspensions of glass particles using the reaction between aluminum metal powder and calcium hydroxide as the gas forming (foaming) mechanism. This route allows the formation of the pores, their size and size distributions at room temperature using slurry rheology as a critical parameter. This article will present the foaming behavior of slurries prepared using recycled soda-lime silica glass that was milled and screened to three different size distributions and mixed with water between 50 and 60 weight % solids content. Carboxymethyl cellulose (CMC) was used as a binder and stabilizer at 2 and 4 weight % of the slurry composition. The results on the dynamic expansion behavior (Figure 1) and the rheology of the suspensions will be presented discussing the critical relation between these two and their effects on the control over the pore formation and structure of the green body. This study aims to provide a new insight for foam glass production by combining the established methodologies utilized in the processing of aerated concrete and conventional foam glass production. Although the study has used recycled soda-lime silica glass as the main ingredient, the discussed method lends itself to using other forms and chemistries of recycled glass making it a viable green technology candidate.

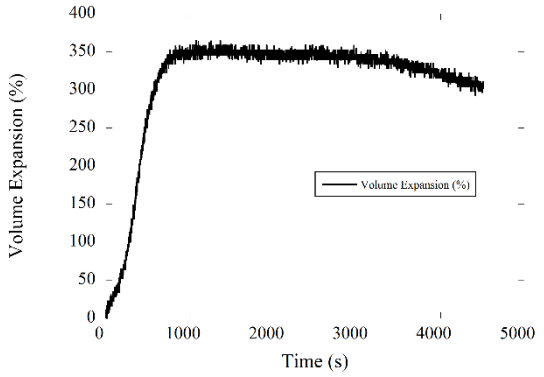

Figure 1 – Dynamic volume expansion behavior of a slurry prepared using glass powder milled and screened to size interval of 38-45 µm at 60 weight % solids content using 2 weight % CMC.

References:

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