

Preparation and characterization of foam-glass using soda-lime glass waste, foaming agent and additives

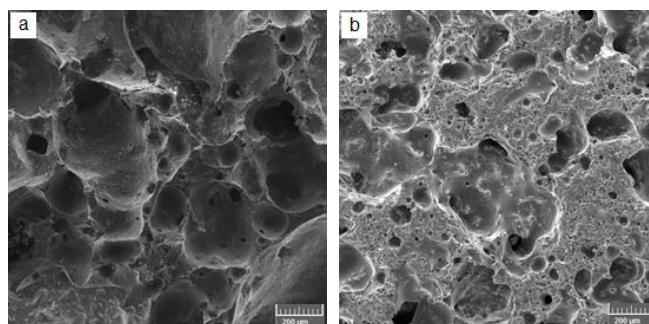
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The generation of waste glass has grown in recent years, which increases the disposal of these wastes in landfills. An alternative for the disposal of waste is its use in the production of foam-glass. The foam-glass is a porous material with low density and has chemical and thermal stability at high temperatures, which are key features in its use as insulating materials in building construction. In this project a study was proposed to obtain ceramic blocks using plain glass waste as raw material. For the production of foam-glass, waste glass was crushed and then milled in roll mill and sieved to obtain powder with appropriate particle size distribution. The raw materials used were characterized through XRD, XFR and TG/DSC analyses. Foaming agents CaCO_3 and additives were added to the glass powder. The mixture was shaped, pressed and heat-treated. The characterization of foam-glass involved the determination of volumetric expansion, density, porosity, scanning electron microscopy, compressive strength and flexural strength. The materials obtained presented different values of volumetric expansion, density and compressive strength and flexural strength, which varied according to the composition. The influence of the composition and heat treatment in the process was evaluated based on the results obtained from the materials produced. The samples showed volumetric expansion values between 24.9 % and 366.9 %, density values from 0.24 g cm^{-3} to 1.09 g cm^{-3} , total porosity between 56.0 % and 90.2 %, flexural strength values between 0.60 MPa and 7.83 MPa and compressive strength values between 0.27 MPa and 10.17 MPa.

Figure 1 - Micrographs obtained by SEM of foam glass with 100x magnification. a) 3 % w/w CaCO_3 ; b) 5 % w/w CaCO_3 .



The conclusion was that obtaining foam-glass using plain glass waste is viable under the conditions used in this work. The variation of the foaming agent concentration significantly influences the volumetric expansion, density, porosity and mechanical strength of the blocks and the type of pore formed, open or closed, influences the mechanical strength obtained. Most of the materials obtained showed total porosity close to 90%, indicating a possible use of the material in construction as insulating agent.

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