DEVELOPMENT OF GLASS-CERAMIC GLAZES BY CRYSTALLISATION OF CERAMIC PHASES OF INTEREST OWING TO THEIR OPTICAL AND MECHANICAL PROPERTIES

[1] M.D. Notari, [1] J. Llop, [1] I. Nebot, [2] J. Vermessy, [2] J.B. Carda, [3] E. Barrachina

[1] Escuela Superior de Cerámica de L'Alcora (Castellón). Spain

[2] Universitat Jaume I de Castelló, Dept. of Inorganic and Organic Chemistry, Castellón. Spain

[3] Tierra Atomizada

1. INTRODUCTION

The purpose of this study has been the development of glass-ceramic glazes by crystallisation of ceramic phases. Glaze compositions with variable silica contents were involved, in which the quantity of one of their constituents has been systematically modified, so that the evolution of the crystallisations could be observed at different viscosities. It was thus sought to obtain glazes with optimum performance in their mechanical and optical properties, adapted to porcelain tile firing cycles.

2. EXPERIMENTAL PROCEDURE

The experimental process is schematically illustrated in figure 1:

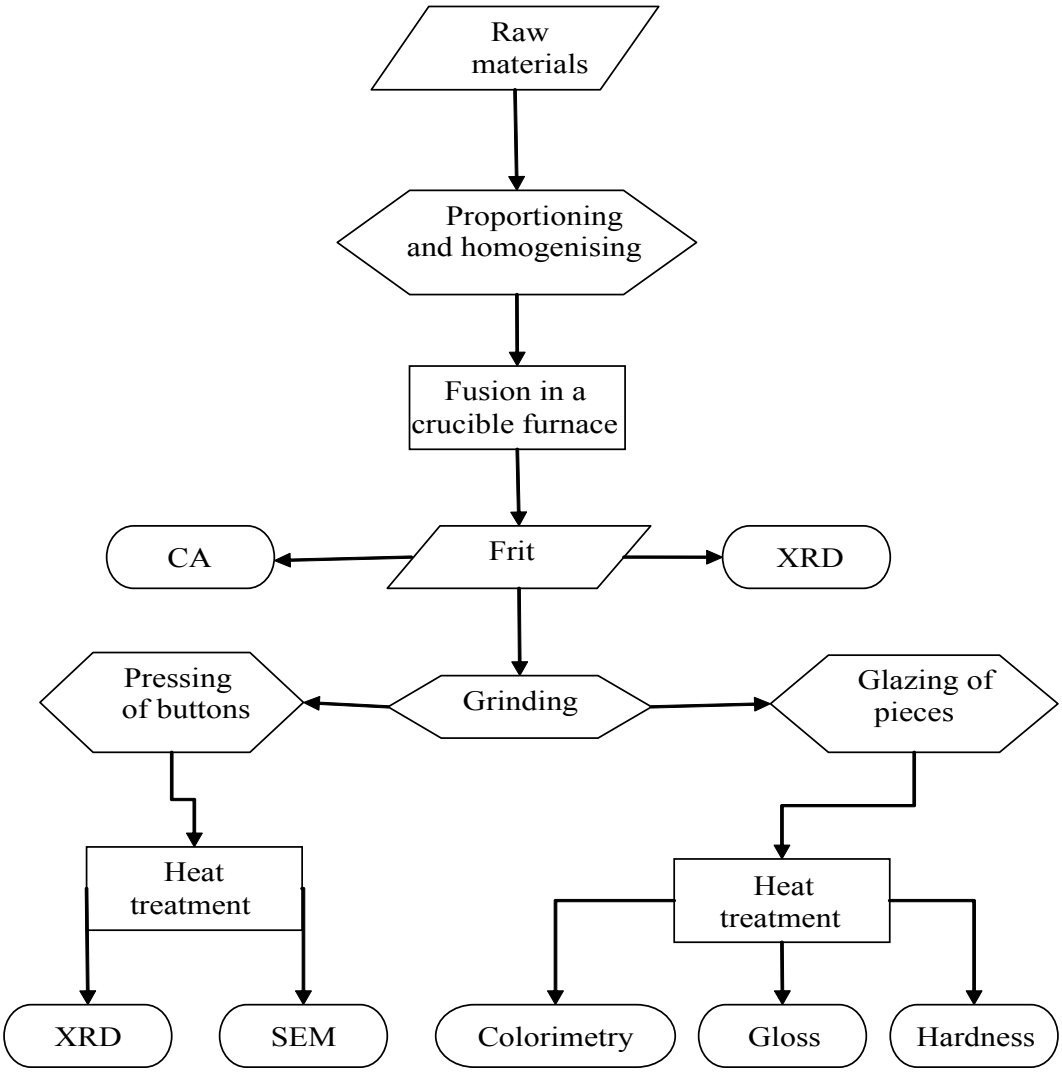

Figure 1. Preparation process.

The tendency of the different compositions to devitrify was studied by subjecting the samples to different thermal treatments, simulating industrial porcelain tile firing conditions.

3. CONCLUSIONS

A study was conducted of different frits, varying their composition in alkalis, silica, and titanium.

When the quantity of silica was varied in glazes prepared with sodium feldspar of Turkish origin, titanium- and albite-rich crystalline phases were obtained. When one of these frits was morphologically studied it was observed that apparent porosity occurred, internally, and crystals larger than 5 microns appeared. In the fired glazes, the Vickers hardness measurement did not surpass the results obtained with the frits prepared with potassium feldspar, though they displayed a greater degree of whiteness at lower firing temperatures.

When frits with a similar content in titanium and silica, prepared with potassium feldspar (of Spanish origin), were studied, the crystalline phases observed by XRD were diopside and silica. The EDX micrograph showed smaller pore sizes and small crystals. In this case, the glazed tiles exhibited better Vickers hardness data and enhanced whiteness at a firing temperature of 1200º C.

In the frits prepared without anatase and those that had larger titanium contents, the variation of the crystalline phases that formed with the change in the silica composition was observed both in thermal analysis and in morphological analysis.

Glass-ceramic glazes were developed by crystallisation of different ceramic phases, enabling glazes to be obtained with optimum performance in their mechanical and optical properties, adapted to porcelain tile firing cycles, prepared with raw materials of national origin.

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