USE OF QUARTZITE WASTE FROM THE TOMBADOR-BA MOUNTAIN RANGE IN THE FORMULATION OF CERAMIC MASS FOR THE PRODUCTION OF CERAMIC COATINGS

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1. ABSTRACT

The Tombador mountain range is a scarp with an extension of over 75 km, where the Mesoproterozoic formation of the same name is found. It is located in the centre of the State of Bahia and forms part of the eastern edge of the region called Chapada Diamantina. The purpose of this study is to take advantage of the quartzite residues generated in the exploitation process of the production of ceramic tiles. In this study, we have prepared five groups of samples with 5, 10, 15 and 20% residue. The raw materials used were characterised by XRD and FRX. The samples were compressed in a uniaxial press, holding the drying at 100°C for 24 hours, and sintered at 900°C, 1000°C and 1100°C during 60 minutes with a heating rate of 10°C/min. After firing, the three-point flexural strength test, linear retraction test, water absorption, apparent porosity and apparent density tests were performed. Microstructural characterisation of samples was performed by scanning electron microscopy (SEM). In general, formulations presented adequate physical and chemical properties for the production of coating, and it is possible to substitute the use of raw materials for conventional waste. Formulations with 10 and 15% residue showed the best results, which allows them to be used for the production of glazed gres porcelain.

2. INTRODUCTION

The accumulation of waste generated by mineral activity is one of the major concerns of modern society, given the huge volume of waste currently produced. One of the ways to face this problem is to reuse residues, incorporating them into ceramic masses for the manufacturing of ceramic products for civil construction. Studies have already demonstrated that the ceramic industry can act as a great ally to consume certain types of waste (Dondi et al., 1997; Menezes et al., 2002). There are several factors that make the ceramic industry attractive for the recycling of waste, such as its use of huge amounts of raw materials and its wide variability from the chemical and mineralogical points of view.

In this context, the proposal of this work is to take advantage of quartzite residues generated in the mineral exploration process for the production of ceramic coatings. These residues are found in the Jacobina-Ba region, specifically in Serra do Tombador.

3. EXPERIMENTAL AND MATERIALS

Montmorillonite clay

Chemical composition of the major elements found in the clay used in this work being observed the presence of: Montmorillonite ($Ca_{0.2}(Al, Mg)_2Si_4O_{10}(OH)_2.4H_2O$) and Caulinite ($Al_2Si_2O_5(OH)_4$).

Mineral Residue

Results of the x-ray diffraction and x-ray fluorescence characterisation of the quartzite residue used in this work dam indicated the presence of quartz and mica.

Preparation of Samples

In this work, the montimorilonite type clay from the city of Vitória da Conquista - BA / Brazil, and mineral residue of the quartzite exploration is from the Serra do Tombador (Jacobina/Bahia/Brazil) were used. Four formulations were prepared, with 5, 10, 15 and 20% of mineral residue.

Sintering:

The sintering temperatures used were 900°C, 1000°C and 1100°C, with a heating rate of 10°C/min for 60 minutes. The furnace used was a Mufla type, brand JUNG - model 0713. In Figure 1, we have the compacted and sintered specimens.

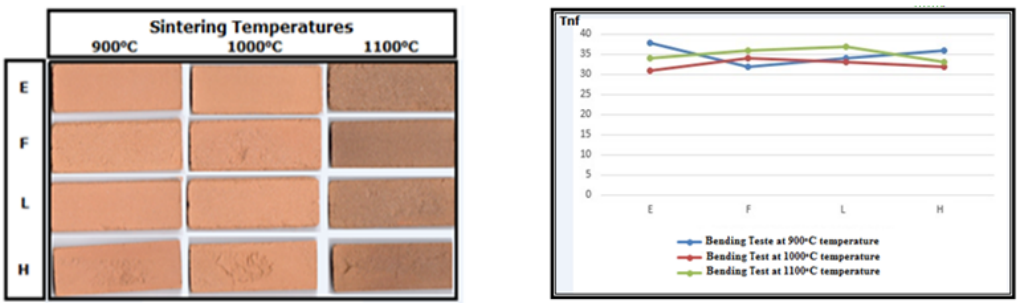

Figure 1. *Test specimens sintered at 900°C, 1000°C and 1100°C and bending test performed.*

4. RESULTS AND DISCUSSION

Water Absorption Test | Apparent Porosity Test | Linear Retraction Test

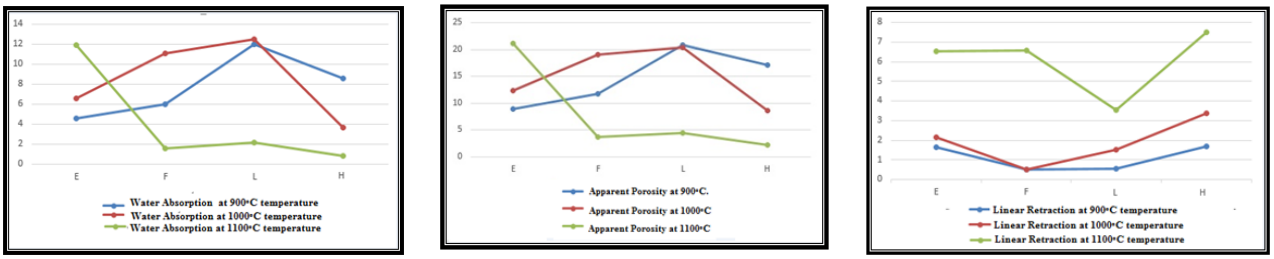

Figure 2. *Technological properties.*

5. CONCLUSIONS

High additions of mineral residue provide a reduction in the mechanical strength of the final product and hamper the conventional production process. However, the incorporation of quartzite mineral residue from Serra do Tombador in the ceramic mass presented satisfactory results. The formulations with residual contents ranging from 10 to 16% were the ones that presented the best results. Water absorption indexes and apparent porosity show that it is possible to obtain products such as stoneware, semigroups and porcelain tiles; as well as porous and semiporous ceramic coatings. By using a 15% residue and burning at 1100°C a product with 0.85% water absorption, low linear shrinkage and an interesting flexural strength for the production of ceramic coatings was obtained.

6. REFERENCES

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