# USING THE RESIDUE OF GOLD EXPLORATION OF JACOBINA-BA IN THE PRODUCTION OF CERAMIC FLOORS

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## 1. ABSTRACT

The proposal of this work is to take advantage of the mineral residues from the gold exploration generated in the exploration process in the production of ceramic floors. In this work, six groups of samples were prepared with 5, 10, 15, and 20% residue. The raw materials used were characterised by XRD and FRX. The specimens were compacted in a uniaxial press, dried at 100°C for 24 hours, and sintered at 900°C, 1000°C and 1100°C on a 60-minute plateau 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 specific mass tests were performed. Microstructural characteriasation of samples was performed by scanning electron microscopy (SEM). In general, formulations presented adequate physicochemical properties for the production of coating, and it is possible to substitute the use of conventional raw materials for residues. Formulations with mineral residue percentages higher than 15% presented the best results, which allows them to be used for the production of ceramic coatings. In addition, adopting the alternative of using these residues will not only reduce the environmental impact of mining, but it will also add value to the final product.

## 2. INTRODUCTION

In the city of Jacobina, the amount of mineral residues from gold exploration corresponds, at present, to about 5 thousand tons / day. The vast majority of mining companies do not present any economically feasible technology or application that allows the recycling of the mineral residue, which is released into receiving areas located in the open, degrading the environment. Monthly production of gold is of the order of 340 kg, generating 190,000 tons of solid waste. According to CBPM - Bahian Mining Research Company, in the first quarter of 2016 the Canadian Yamana Gold produced 91 thousand ounces of gold, corresponding to a 26% increase over the same period of the year 2015. Jacobina was the best performing asset, producing 30,000 ounces of gold, up 61% over the first quarter of 2015.

Seeking to unite experiences and technical information that favour sustainable development and have important benefits to the civil construction sector and society in general, the present work presents as a central proposal the exploitation of mineral residues from the gold exploration generated in the exploration process for the production of ceramic floors.

## 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 residue of the mineral residue dam indicated the presence of silicon oxide (PDF2: 03-1092), quartz (PDF2: 79-0564), goethite (PDF2: 01-0401), and pyrite (PDF2: 02-1366), with a chemical composition of 90.8% $SiO_2$; 3.9% $Al_2O_3$; 1.6% $Fe_2O_3$ and 1.4% MgO. $SO_3$ (1.3%), $K_2O$ (0.54%) and $TiO_2$ (0.19%) were identified.

**Preparation of Test Specimens:** In this work, montimorilonite type clay from the city of Vitória da Conquista - BA / Brazil and mineral residue from the Jacobina-Ba / Brazil gold exploration 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

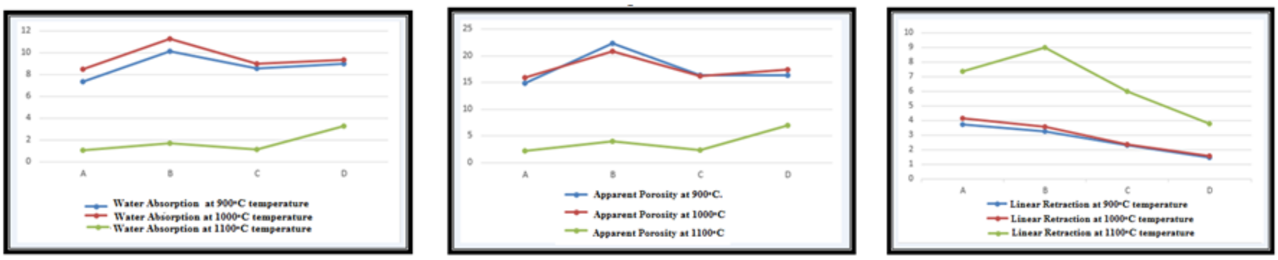


***Figure 2.*** *Technological properties.*

## 5. CONCLUSIONS

When analysing the results of water absorption and apparent porosity, it can be seen that, in the range of 1100°C, all formulations presented results that favour the use of residue in the formulation of ceramic coatings for the production of stoneware and semigrass. Notably, raising the firing temperature to a plateau in the range of 1200°C to 1250°C, according to preliminary results, we can extend the use of this residue for the production of more noble coatings, such as porcelain tiles. The best results obtained lead to an ideal percentage of around 15% of mineral residue. At temperatures around 900°C and 1000°C, the results suggest the production of semiporous and porous ceramic coating.

## 6. REFERENCES


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