PRODUCTION OF CERAMIC BLOCKS WITH THE INCORPORATION OF MINERAL WASTE IN TRADITIONAL CERAMICS

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The Rio Grande do Norte is the 4th national producer of mineral resources in Brazil. The most varied resources are produced here, in particular iron, gold, tantalite, kieselguhr, oil, natural gas, limestone, feldspar, salt, quartz, kaolin, ornamental stones, mineral water, gems, scheelita, among others. The mineral extraction activity is considered a highly degrading due to the large volume of material it moves in the form of ore and waste, the major concern at present being to manage and provide a final destination for all the waste produced, minimizing the environmental and social impact. Furthermore, the production of ceramics in the State occupies a position of industry and capital goods, contributing to the development of the local economy, only producing tiles, bricks and ceramic blocks. In the most recent geological map of Rio Grande do Norte, over 2 thousand facilities were analysed that produced or were producing some kind of mineral. This work aims to characterize and evaluate the possibilities of using granite and marble tailings, together with scheelita waste, in the composition of ceramic blocks. We collected samples of granite and marble mineral waste, in addition to waste from scheelita companies in the region of the newborn Seridó, which were then characterized by determining their size distribution, chemical analysis (EDX), X-ray diffraction, ATD, ATG and SEM. After characterization four groups of samples were prepared with percentages of 10, 20, 30 and 40% waste for traditional ceramic bodies. The samples were formed in a uniaxial press, heated to a temperature around 100º C for 24 hours, removing all the moisture present and then sintered at 850ºC, 900ºC, 1000ºC and 1100ºC. The final products obtained were tested for porosity, plasticity, in addition to undergoing thermal analysis and observation by optical microscopy and SEM. The results found indicate that the ceramic composites obtained have physical and mechanical characteristics similar to those of traditional ceramic bodies used in the production of blocks and tiles, in addition to features present within the regulatory specifications for the production of ceramic blocks, demonstrating the technical feasibility and economical production of these ceramic blocks.

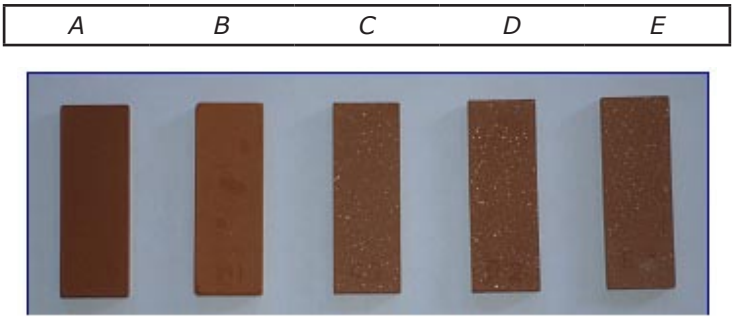

Figure 1. Samples sintered at 850, 900, 1000 y 1000ºC, with a rate heating of 5ºC/min.

Increases in the high mineral waste content will affect conventional ceramic processing, since, in general, the products involved are produced via extrusion

(tiles, bricks,...). This is because of the differences in behaviour between the plastic clay and the waste (which reduces plasticity), which would certainly hinder the manufacturing process. Moreover, high levels of waste would reduce the mechanical strength of the final product. It was noted that at the sintering temperatures used, the results were higher than those of the standard ceramic mass used, suggesting that the use of mineral waste with percentages of around 20-30% is technically feasible and economically interesting. Another reason for such use is to refocus and better use natural resources, providing an alternative destination for this mineral waste, in addition to adding value to the materials produced by improving their physical and mechanical properties. Regarding porosity, there was no significant variation in the rate of absorption with different percentages of the waste added to the clay mineral. However, the linear shrinkage values decreased with higher waste addition percentages. The results presented in this paper show that it is possible to add granite, marble, and scheelite waste minerals to the ceramic body in percentages of 20-30%, without sacrificing the quality and the physical and mechanical properties of the final product.

It is evident that research into the use of mineral waste, by incorporation into the clay used in manufacturing traditional ceramic products, is a very important line of study, in addition to reusing wastes dumped by the mining industry, contributing to climate change.

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