DEVELOPMENT OF CERAMIC COATING WITH THERMAL COMFORT ON CONTACT

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ABSTRACT

The sensation of thermal comfort of an individual to the built environment around him is related to the local environmental conditions and the properties of materials used. The adequacy of the microstructure and the consequent increase in surface roughness of tiles may lower its thermal conductivity. This work presents studies of the development of non-glazed tiles for indoor environments designed from the reuse of industrial waste. Reducing the density of ceramic bodies can be obtained by the inclusion of pores resulting from raw materials and processing conditions employed. Assessments of thermal comfort of tiles developed are described by their thermal and mechanical properties. The results show that the incorporation of the residue results in the formation of surfaces with higher roughness and also as the porosity and roughness increase, there is a significant improvement in comfort on contact.

1. INTRODUCTION

The theory of thermal comfort is based on the level of heat transfer of materials and property that expresses the rate of heat transfer on the surface of solids is called effusivity. This property shows the changes in the temperature of a body with the variation of atmosphere temperature. The presence of porosity in ceramic materials implies a low thermal effusivity that can be directly correlated with low conductivity, density and a consequent reduction in mechanical strength.

The residues from the process of polishing and grinding are basically made of the components of the support and glazed ceramic layer and the abrasive material is removed in the process. This material received a classification prior to the treatment and final disposal, as waste that doesn't show health hazard. The reuse of these materials allows materials to be obtained that present high porosity, resulting in a low density and excellent thermal and acoustic insulation. This feature is due to the decomposition of the abrasive agent (silicon carbide, SiC), coming from the polishing sandpaper, with oxygen during thermal processing of the new developed product. The SiC decomposition generates gas, causing volume expansion of the piece.

Based on these results, through the intervention of design, the development of new concepts for ceramic tiles is proposed, in which, the use of alternative materials enables a new type of interaction to emerge between the User and the product, with greater importance being attached to the technical surface characteristics, involving new design arrangements through the composition made of different pieces and elements, emphasizing the contrast and the three-dimensionality of the environment.

2. THERMAL COMFORT (MATERIALS AND METHODS)

Thermal comfort was evaluated correlating the contact temperature of the human body with the coating sample. For the conductivity and flexural strength test were prepared ceramic samples, with variations in the quantities of waste, which after burning process showed different degrees of porosity and surface roughness. Industrial experiments were made with sample composition of 40, 50 and 60% of waste polishing and grinding, adding to an atomized mass of semi-stoneware (percentages established in preliminary tests, small samples, 100x30mm). These compositions were evaluated at temperatures of 1100, 1120, 1140 and 1150 °C. The characterization of prepared pieces followed the industrial parameters: firing cycle of the industrial furnace of 45 minutes with four ramps of about 5 minutes in the burning zone.

3. RESULTS AND DISCUSSION

It can verify that the incorporation of the residue results in the formation of surfaces with greater roughness, as well as enhance the effect of expansion in higher temperatures. The presence of roughness favours in many ways the characteristics of thermal comfort.

Materials with low conductivities and densities can be obtained by the inclusion of pores maintaining the properties and characteristics required for the finished products. Properly combining the raw materials and processing techniques, it is possible to obtain porous ceramic with satisfactory values of mechanical strength, chemical resistance and high refractoriness and structural uniformity of thermal properties favourable to its application.

The introduction of porosity in ceramic tiles implies in a low thermal effusivity that is directly correlated with conductivity and density. The less effusivity, the more comfortable tiled floor. This feature can also give good acoustic properties.

The thermal sensation of cold or heat depends on the local environmental conditions and the material properties including its microstructure and surface roughness. The introduction of porosity and rough surface (contact resistance) to ceramic promotes thermal comfort (walk-coating).

The development of coating with surface formatting ally to material characteristics, such as thermal comfort, lightness, porosity, will create a product line where sophistication is also synonymous of simplicity, essential nature, comfort and integration. Specific searches are necessary to deepen the knowledge about the acoustic properties and light presented in this material.

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