Mechanical Properties and chemical stability of Roof Tiles: a mixture of Cathode-Ray Tube (CRT) waste glass and Allophane material from Bamboutos (Cameroon) fired at different temperatures

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Abstract:
The use of Cathode-Ray Tube (CRT) wastes as fluxing agent in replacement of Feldspar contribute to reduce the energy necessary to sintering fired ceramic. In this work, the effect of CRT waste glasses and allophane on the physico-mechanical properties and chemical stability has been investigated. Commercial tile and roof are the vitrified ceramic that are composed of clay, feldspar, and quartz. The manufacturing of these ceramic products requires high temperature sintering at least at 1250°C that result in high energy costs a great quantity of thermal energy is consumed in the firing stage. The aim of this work is to produce ceramic tile with low energy consumption and that have good physicochemical and mechanical properties. The raw materials were characterized in terms of mineralogical and chemical composition. Different mixtures with various amounts of glass were prepared and fired in the temperature range of 700–950°C, for 4h. The influences of waste glass content on the technological properties (linear shrinkage, water absorption, bulk density and flexural strength) were determined. Microstructural analysis of the fired samples was carried out by X-ray diffraction and SEM. The experimental results revealed that Raw materials have good fluxing properties which were improved with firing. Mechanical and physical tests such as Linear shrinkage, water absorption, open porosity, bulk density, flexural strength, loss on ignition, chemical stability and leaching were used to evaluated the behaviour of ceramic bodies at sintering temperatures of 700°C, 750°C, 850°C and 950°C respectively. The results showed that best physico-mechanical properties were obtained at 850°C with 30% CRT waste glass added while water absorption drastically reduced from 16 to 7%, porosity fell from 27 to 10.41% and flexural strength increased from 5.98 to 20.26MPa. This improved behaviour observed around 850°C can be attributed to better glassy phase formation.

Biography:
Paul Nestor DJOMOU DJONGA, Doctor in metallurgy obtained at the University of Maroua in Cameroon. He has worked on the relationships between the Influence of CRT Glass Quantity on the Properties of Red Mud-CRT Glass Ceramics Fired at Different Temperatures. This work was done in collaboration with his colleagues. Currently, he is a Phd student in the University of Maroua, Nigeria.

Publication of speakers: