STUDY OF THE SINTERING OF A RAW MATERIAL FOR CERAMIC TILE MANUFACTURE THROUGH HOT STAGE MICROSCOPY AND AUXILIARY TECHNIQUES – PRELIMINARY RESULTS

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The clays from the Corumbataí Formation (Paraná basin, southeastern region of Brazil) supply the Santa Gertrudes Ceramic Pole (Rio Claro region, São Paulo), which is currently one of the largest ceramic floor and tile producers. As a result of the abundant raw materials, the factories did not conduct detailed studies of the materials, using the best quality materials without planning for the future. As a result, there is currently a search for new raw materials or for wastes and materials that could be used which were not used before, now that the best mines have already been used. In this study, a level of the Corumbataí Formation has been characterised, which has not been previously used because it contains a certain amount of organic matter (figure 1).

Figure 1. (A) General view of the mine where the sample was collected. (b) Detail of the material rich in organic matter. (c) Altered pyrite nodule found next to sandstones, where there are also fractures occupied by calcite.

This sample was characterised with regard to its chemical and mineralogical nature (tables I and II) by X-ray fluorescence and X-ray diffraction, as well as by optical microscopy and scanning electron microscopy. Its sintering behaviour was characterised in a hot stage microscope (figure 2), and it was further characterised by ceramic tests on test pieces.

Sample	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	Na_2O	K_2O	MnO	P_2O_5	P.P.C.*	Total
CR_B2	67.16	14.7	4.97	0.63	0.44	2.85	2.96	3.13	0.04	0.12	2.99	99.97

**L.O.I. = Loss on ignition.*
Table I. Chemical analysis of the sample.

Sample	Illite	Chlorite	Quartz	Albite	Hematite	Calcite	K-feldspar
CR_B2	x	x	x	x	x	x	x

Table II. Mineralogy found through X-ray diffraction.

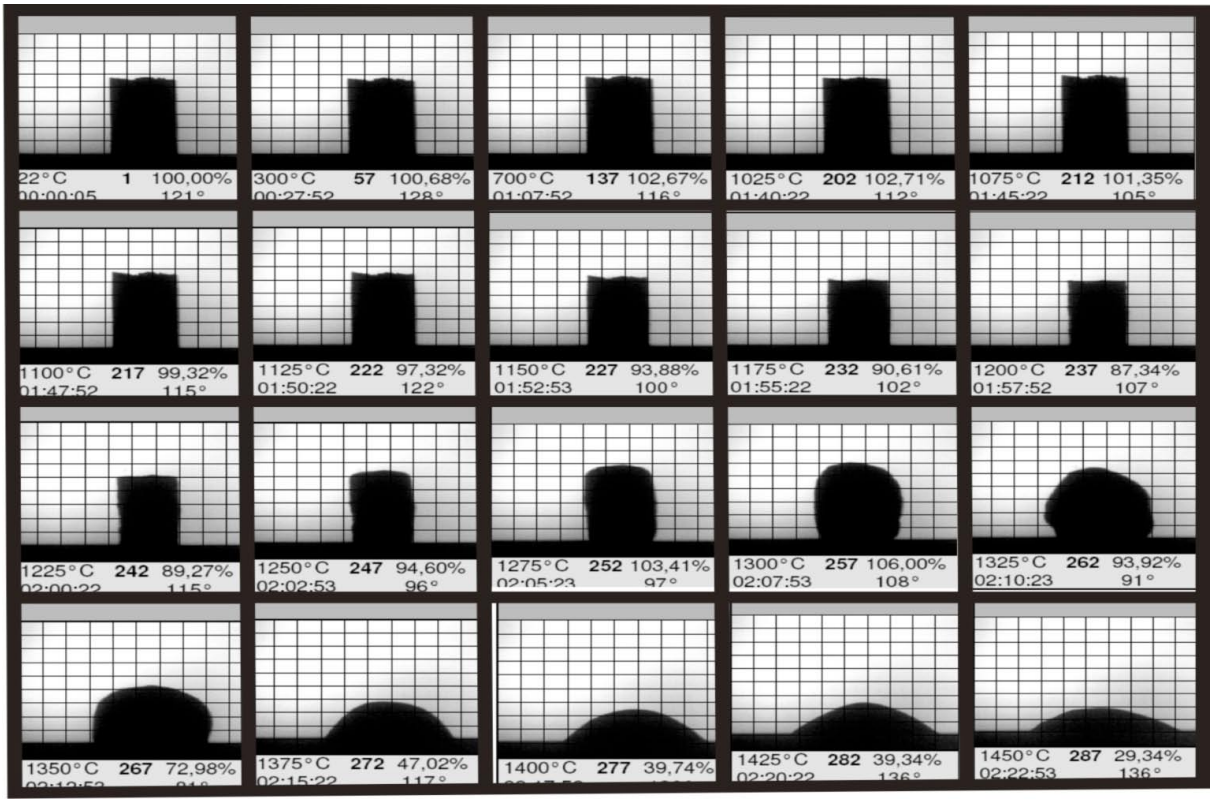

Figure 2. Photographs of the test piece subjected to heat treatment in the hot stage microscope.

The tests showed that this material had suitable characteristics for use in ceramic tile manufacture at lower temperatures (compared with those used for products already being produced in the region), since its sintering would be catalysed by the presence of organic matter. The optimum firing temperature would be about 1050ºC while other raw materials of the unit would need temperatures of about 1100ºC to 1150ºC for complete sintering. This temperature change is economically interesting, since it means a saving in firing fuel and time. Another important feature is the high mechanical strength after drying and firing. A further use for this material would be in the manufacture of lightweight aggregates, once, after given firing temperatures, expansion could occur as a result of gas release.

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