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Assessment for the use of waste of trachyte in the brick production

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The preliminary results of the potential advantage of incorporating wastes from a quarry's trachyte, as temper in brick production is the main aim of this work.
Three different mixtures elaborated by adding 5, 10 and 15 wt. % of trachyte were studied. Each mix was fired in a electric oven at the temperatures of 900, 1000 and 1100 °C.
The influence of the waste addition was investigated under micro and meso-scale and considering several aspects in order to define aesthetic, mineralogical and physical features of fired samples. The microstructure of the samples was evaluated by X-ray powder diffraction and scanning electron microscopy. The main phases identified were quartz, plagioclase, K-feldspar, biotite, hematite and diopside. Colorimetric study highlighted changes on the chromatic appearance depending on the trachyte contents and the firing temperatures reached.
Hydric parameters (UNI EN 772-7, 1998) showed a decreasing absorption behaviour and an overall poor interconnection of pores for samples with the highest content of trachyte (15%). The values of open porosity determined by hydric test were comprised between 35 and 38% and decreased with increasing the firing temperature and the trachyte content. Mercury intrusion porosimetry showed the pore size distribution in the range comprised between 0.001-100 μm. The results of total open porosity obtained (from 19 to 38%) were quite similar to those measured by hydric tests.
Physical-mechanical properties and structural anisotropy were checked combining the uniaxial compressive strength (DT) and the ultrasound velocity test (NDT). A rather closed concordance between these techniques was observed when comparing the average values of mechanical stress and the propagation velocities of ultrasound waves.
Finally, freeze-thaw (UNI EN 12371) and salt crystallization tests (UNI EN 12370) carried out on bricks proved their high resistance to decay under stressed environmental conditions.
The results of the present investigation contribute to understand the possibilities of recycling waste of trachyte to obtain new brick types and satisfying the necessity of saving energy, reducing the production costs and preserving the shortage of raw materials.

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