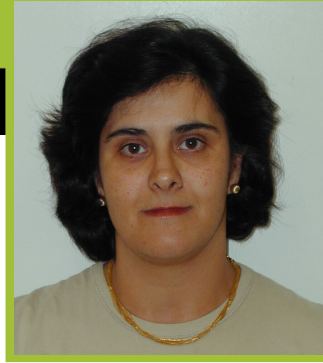


Department of Materials Science - CENIMAT / I3N

Ceramics: Macro to nanoscale

Structural Materials group
at DCM/FCT/UNL and Cenimat / I3N



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PhD in Materials Science,
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Current Research :Glasses and
ceramics materials. Recycling
by ceramic processing.
Ecomaterials. Hydration
products of cementitious
materials.

Objectives

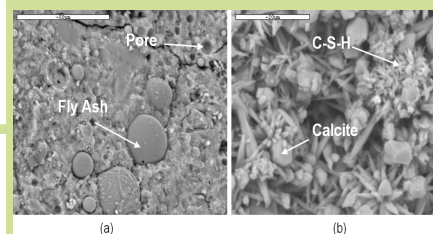
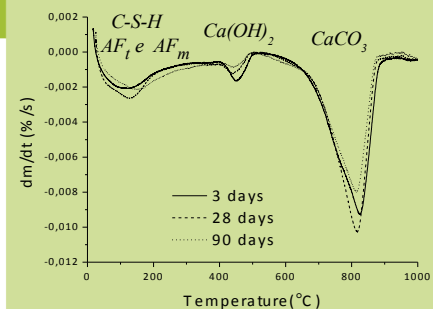
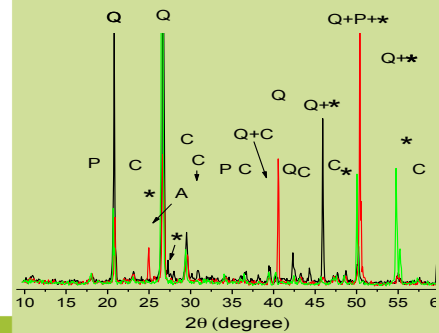
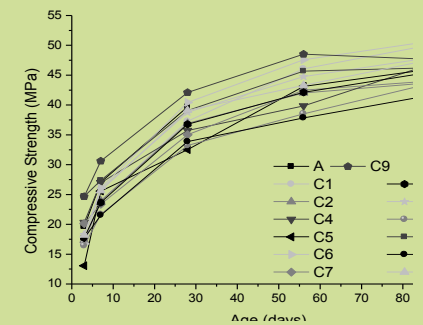
This work reports the correlation between compressive strength and hardness of C25/30 concrete. A comparison was made between values obtained from compressive strength tests and scratch tests performed on cubic specimens at the ages of 3, 7, 28, 56 and 90 days. The influence of aging time on mechanical properties of concrete was followed by chemical, microstructural and thermal analysis of cement pastes. Scanning electron microscopy analysis was employed to obtain a view of the microstructure of the cement paste samples at the ages 3, 28 and 90 days.

Methodology

All the raw materials used in present study were supplied by Unibetão. The specimens were manufactured according to NP EN 12390-2:2003, being manufactured and tested 380 cubic specimens with dimensions 150×150×150mm³. Cement paste prisms 40×40×160mm³ were made with the same mixing of cubic specimens that was passed through a sieve with a mesh opening of 4.75mm and underwent the same curing conditions. Once removed from the cure and dry (at least 24 hours), the materials were reduced to small pieces with the aid of a mallet. This reduction was set aside a few pieces (bulks) for tests of SEM and XRD, and the remainder was reduced to powder in a hammer mill using a sieve of 1.5 mm.

Expected Results

XRD and the microstructural analysis showed the formation of calcite (CaCO₃), calcium silicate hydrate (3CaO.2SiO₂.3H₂O), portlandite (Ca(OH)₂) and ettringite (3CaO.Ai₂O₃.3CaSO₄.32H₂O). These crystalline phases were also identified by thermal analysis. From the analysis of mechanical data a numerical expression was fitted which correlates the compression results with the hardness values obtained on concrete samples. The compressive strength results are within the expected values for these concrete classes and the increase in strength of concrete with age was verified as expected.



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