Joint Research Project

Development of Ecomaterials for Low-Cost Housing

Rodrigo Fernandez, Prof. K. Scrivener (EPFL), Prof. F. Martirena (UCLV)

➢Objective

This joint research project is intended to study pozzolans derived from mineral or agricultural sources in developing countries and understand their effect as cement replacement in concrete. Through combined research in the field and characterisation tools available at EPFL, we hope to be able to support consistent production processes to predict the long term behaviour of such materials.

PROCESSING

➢The solid fuel block (SFB) concept for the production of reactive pozzolans

1. Raw Materials:

Industry | Agriculture

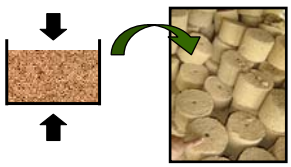
Waste : Sugar cane straw, RHA, Sawdust

2. Mixing:

Sugar Cane Straw + clay + water

" Fuel " " Binder "

3. Compression:



Solid Fuel Block (SFB)

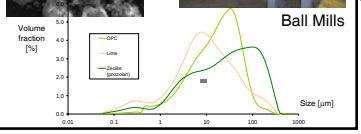
4. Calcination of SFB

Artificial pozzolan

Vertical Shaft Kiln (750°C-900°C)

5. Grinding

Ball Mills



6. Blending

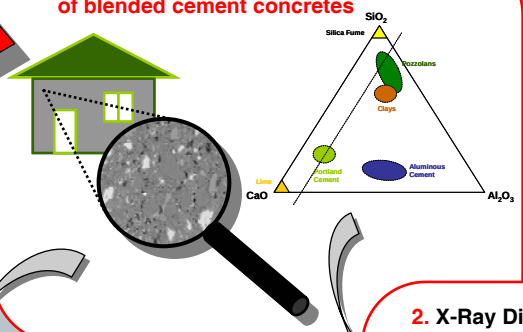
Cement

Reactive Pozzolan

Lime

CHARACTERISATION

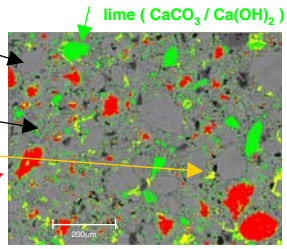
➢ Microstructural analysis of blended cement concretes



1. Scanning Electron Microscopy (SEM)

FEI Quanta 200

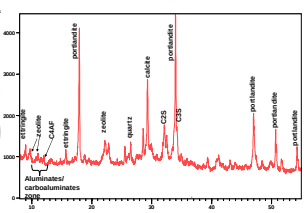
Typical measurements with this instrument include Hydration rate of the cement and its porosity. It is also equipped with an Energy Dispersive Spectrometer (EDS) for chemical analysis and phase identification.



Microstructure of a 28 days cement paste where 50% by weight of the cement has been replaced by a Lime-pozzolan (zeolite) binder

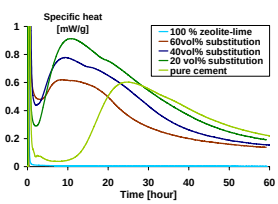
2. X-Ray Diffraction (XRD)

PANalytical X'Pert Pro X-Ray diffraction system



XRD Diffractogram of a 28 days cement paste where 30% by weight of the cement has been replaced by a Lime-pozzolan (zeolite) binder

3. Isothermal Calorimetry



Hydration kinetics of different mixes, represented by the specific heat released [mW/gr] as a function of time

EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

From Laboratory level to full scale trial in the field…

FNSNF Fonds national suisse Schweizerischer Nationalfonds Fondo nazionale svizzero Swiss National Science Foundation

Acknowledgements:
- The financial support of the Swiss National Fund for research (FNS) is gratefully acknowledged.
- Kurt Rhyner (ECOSUR), Mathieu Antoni (EPFL)

ECOSUR SOUTH