V Jornadas de Jóvenes Científicos en Materiales de Construcción

Workshop "Situación actual y perspectiva de los materiales de construcción"

27-28 de noviembre 2023

Universidad Carlos III de Madrid

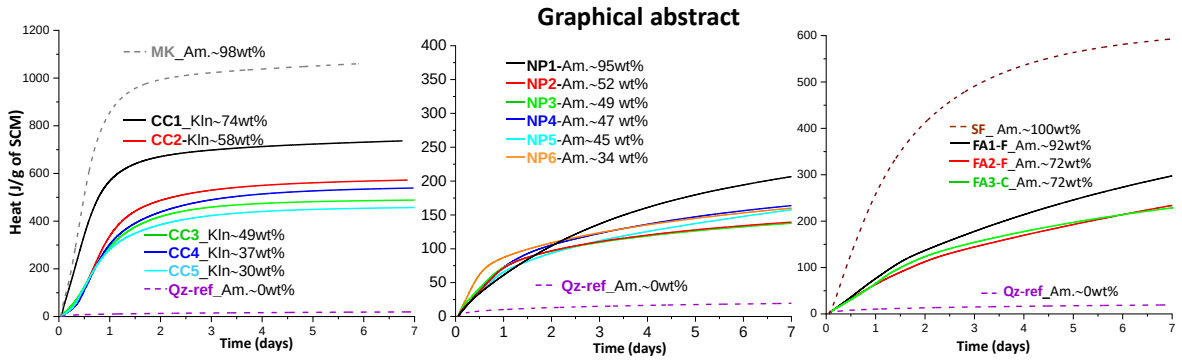
Universidad de Barcelona

PROGRAMA FINAL Y LIBRO DE ABSTRACTS

Materiales puzolánicos para bajar las emisiones de CO_2: soluciones locales para un problema global Pozzolanic materials to reduce CO_2 emissions: local solutions for a global issue

A. G. De la Torre, I. Koufany, C. Redondo-Soto, B. Guirado-Rodríguez, E. M. Benjumea-Rejano, F. Gómez-García, A. Cuesta, I. Santacruz, M.D. Rodríguez-Ruiz, M.A.G. Aranda

[1]*Dpt. Química Inorgánica, Cristalografía y Mineralogía. Universidad de Málaga, Málaga, España.*
Corresponding author: e-mail: *mgd@uma.es*



Heat evolved in R^3 test by Spanish calcined clays (CC), Natural Pozzolans (NP) and fly ashes (FA). MK stands for metakaolin and SF for silica fume, as references

Abstract

In recent decades, the cement sector has been looking for solutions to reduce the carbon footprint, being one of the most promising strategies, the replacement of clinker with supplementary cementitious materials, SCMs. However, the main limitation of this approach is the availability of suitable SCMs.

This work presents the study of three families of pozzolanic materials, Spanish calcined clays (CC), Natural Pozzolans (NP) and fly ashes (FA). The characterization of each family will be presented, with emphasis on the kaolinite content of the original clays and the amorphous contents of the natural pozzolans and fly ashes.

The results of the pozzolanic prediction tests will be compared: strength activity index, SAI, and R^3 test according to ASTM C1897-20.

The SAI test has two important limitations: i) it gives false positives at 28 days, as does the addition of quartz (Qz) and ii) a minimum of 28 days is required to obtain the pozzolanic activity results.

In addition, the R^3 test has proved to be useful in ruling out inert additions, such as quartz. Moreover, it presents a very good correlation between the heat emitted and the combined water at 7 days and the amount of kaolinite in clays or amorphous in ashes. However, the absolute values of heat and combined water cannot be compared between different families. That is, in the calcined clay family, it can be inferred that if the kaolinite content is higher than 50 wt%, the heat released should be between 500-700 J/g, whereas a fly ash with an amorphous content of around 70 wt% will release between 200-250 J/g.

Acknowledgements: PID2020-114650RB-I00 grant from Spanish government, Master Builders Solutions Deutschland GmbH (Germany) and Buzzi Unicem SpA (Italy) are thanked for the funding.