

Accepted Manuscript

Assessment of pore structure evolution in the limestone calcined clay cementitious system and its implications for performance

Yuvaraj Dhandapani, Manu Santhanam



PII: S0958-9465(16)30558-3

DOI: [10.1016/j.cemconcomp.2017.08.012](https://doi.org/10.1016/j.cemconcomp.2017.08.012)

Reference: CECO 2891

To appear in: *Cement and Concrete Composites*

Received Date: 18 September 2016

Revised Date: 31 July 2017

Accepted Date: 21 August 2017

Please cite this article as: Y. Dhandapani, M. Santhanam, Assessment of pore structure evolution in the limestone calcined clay cementitious system and its implications for performance, *Cement and Concrete Composites* (2017), doi: 10.1016/j.cemconcomp.2017.08.012.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 **Assessment of pore structure evolution in the limestone calcined clay cementitious**
2 **system and its implications for performance**

3 Yuvaraj Dhandapani and Manu Santhanam*

4 Department of Civil Engineering, IIT- Madras, Chennai 600036, India

5 *Corresponding author. E-mail address: manusanthanam@gmail.com (M. Santhanam)

6
7 **Abstract**

8 Use of limestone and calcined clay together for clinker substitution makes an effective low
9 clinker cement blend, which shows promising mechanical properties at early ages. The
10 performance of these cementitious systems strongly depends on the pore structure, which is a
11 dominant factor governing the durability characteristics because of its direct influence on the
12 transport properties. The experimental study described in this paper on three different binder
13 systems including Ordinary Portland Cement, Portland Pozzolana Cement - with 30% Type F
14 Fly Ash (designated FA30) - and Limestone Calcined Clay Cement (LC³) pastes shows that the
15 LC³ system attains greater refinement of the pore structure as early as 3 days, as seen from
16 mercury intrusion porosimetry. Electrical measurements also reveal lower conductivity in the
17 system, which suggests better resistance to ionic transport in the binder phase. The results of
18 hydrate phase assemblage studied by X-ray diffraction also indicate that greater amount of
19 hydrates contribute in a major way to the reduction in the (water-filled) porosity in all the
20 systems. This change occurs at varying rates for the different systems due to the difference in
21 hydration characteristics. The estimated permeability suggests that the LC³ binder system attains
22 much lower permeability compared to the ordinary Portland cement and FA30. A comparison of
23 the formation factor shows distinct differences in the microstructural development and suggests a
24 more durable binder with LC³ cementitious system.

25 **Keywords**

26 Limestone; calcined clay; pore structure; conductivity; formation factor

Download English Version:

<https://daneshyari.com/en/article/5436748>

Download Persian Version:

<https://daneshyari.com/article/5436748>

[Daneshyari.com](https://daneshyari.com)