

CeraTech

Project Number 156269

Microscopy and XRD Examination of RediMAX

Date:
August 25, 2008

Submitted by:
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REPORT OF LABORATORY EXAMINATION

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Re: Petrographic Examination of RediMAX Powdered Sample from CeraTech

One powder sample, identified as RediMAX (Figs. 1 to3) was received on July 21 from Mr. Leo Kahl, CeraTech Inc., Baltimore, MD. The submitted sample was reportedly a commercial cementitious product.

The product reportedly has sustainability benefits when compared to more traditional cement based materials.

Microscopic examination (ASTM C 856) of the RediMAX sample was requested to determine the fly ash content of the material in support of its sustainability benefits - due to use of non portland cement based by product material.

FINDINGS AND CONCLUSIONS

The powder mount specimens showed the material to consist of numerous amorphous and partially crystalline spherical fly ash spheres plus mineral components. The latter were of more than one type, based on the varying optical properties observed. Black irregular shaped opaque particles were present to a limited degree and are typical of carbon as found in fly ash. A small degree of agglomeration of some of the material is observed. Identification of the mineral components was not attempted as part of the scope of this work.

A complicating factor, in quantifying the various components, is that the mineral components can be both discrete particles from an added material but could also be a mineral component of fly ash. Where the particles are spherical, these are all fly ash, and these were found to constitute 47% of particles based on a point count of 500 particles. Other particles that also appeared to obviously be fly ash based on their partially spherical nature and/or their partially amorphous nature constituted another 18%. Discrete mineral grains (32%) and carbon (3%) made up the remainder.

Using a 530 nm plate, the percentage of non isotropic discrete mineral grains is found to vary between 10 and 30% in several fields of view examined, with an average of approximately 20%.

The x ray diffraction pattern was used to approximately differentiate the areas due to crystalline and amorphous material and the result was 40% and 60% respectively.

The above information suggests that fly ash constitutes a minimum of 65% of the sample. When taking into account the fact that amorphous material is approximately 60% of the sample, and that some of the smaller mineral components will likely also be from the fly ash it is probable that the fly ash is in excess of 80% of the sample and possibly more.

Due to the complex assemblage of the components it is not possible to be more precise about the exact quantity of fly ash in the sample supplied.

METHODS OF TEST

The powdered sample was examined, as received, by preparing several specimens of the material as powders mounted on glass slides, and dispersed in a liquid of known refractive index (1.54). These were then examined in transmitted light on a polarizing microscope at magnifications up to 400x (Figs.1). This allows identification of glassy material, spherical fly ash particles, and mineral components. The identification of amorphous material was aided by the use of a 530 nm plate (Fig.2). As a supplement to the microscopy, the material was briefly analyzed by x ray diffraction (Fig. 3).



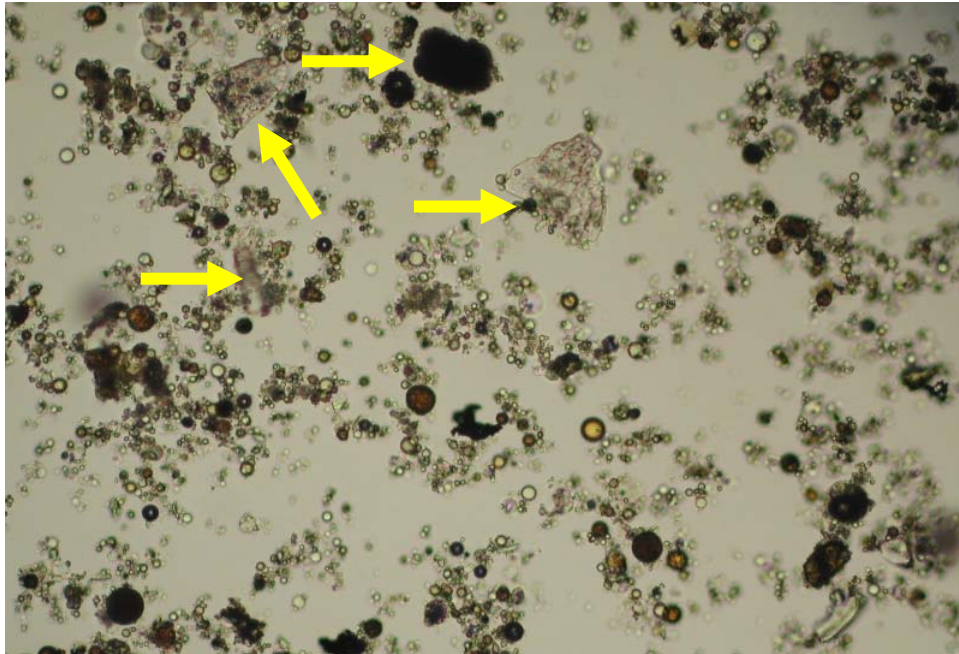
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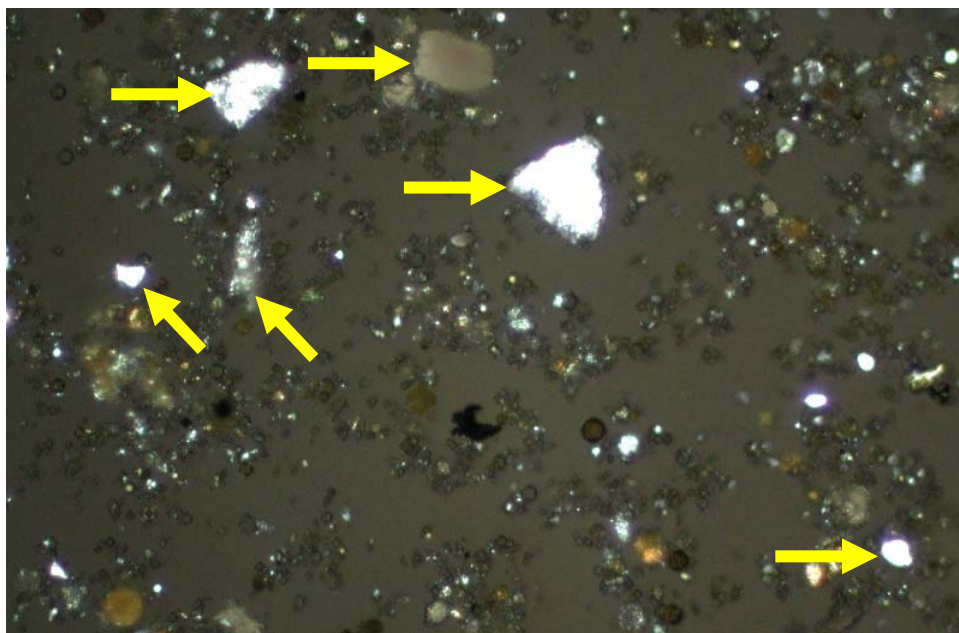
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Attachments

- Notes:
1. Results refer specifically to the sample submitted.
 2. This report may not be reproduced except in its entirety.
 3. The sample will be retained for 30 days, after which it will be discarded unless we hear otherwise from you.



1a.



1b.

Fig.1 Sample as received and seen in plane polarized (1a) and crossed polarized light (1b). The numerous spheres are fly ash particles, and mineral grains are arrowed. Width of view is approximately 140 microns.

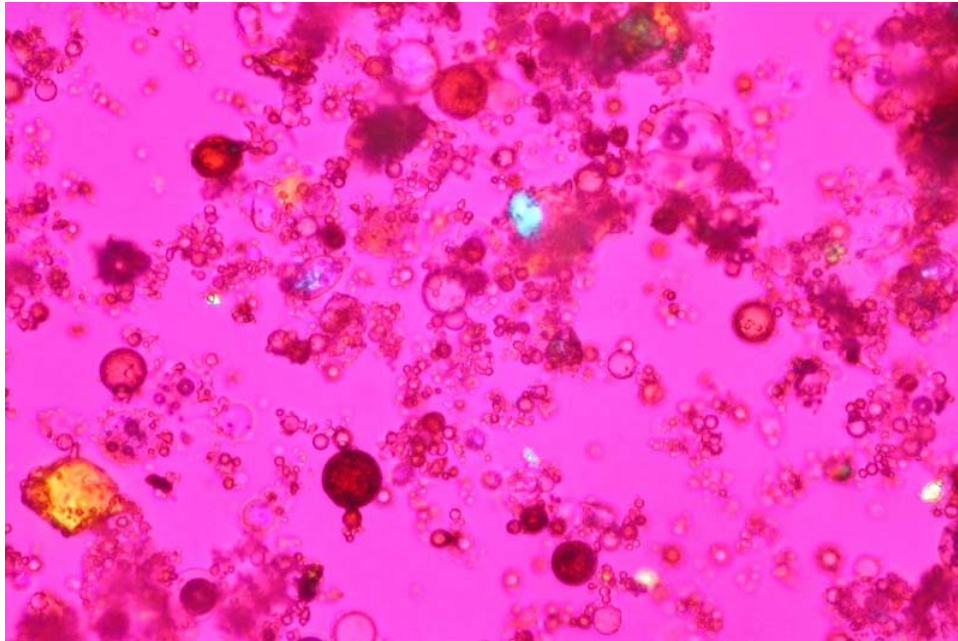


Fig. 2 View using 530 nm plate. Those particles that are the same pink color as the general background are non isotropic (assumed amorphous). Width of view is approximately 140 microns

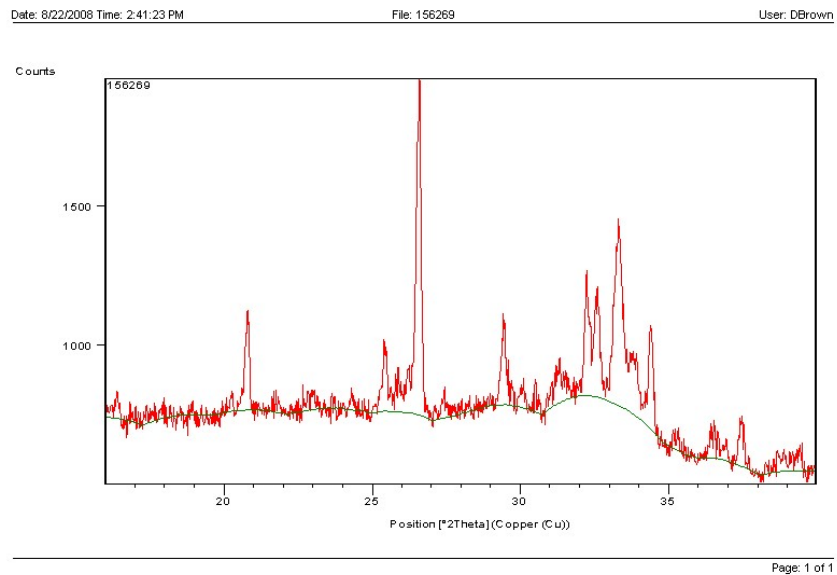


Fig. 3 Peaks in the x ray diffraction patterns are due to several distinct mineral components, while the area under the curved background represents the non crystalline (amorphous) material.