

Diagenesis of FBC ash in a Reclaimed Mine Pit Lake: A Case Study in Long-Term Implementation

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KEYWORDS: Fluidized Bed Combustor Ash, Cementitious characteristics

ABSTRACT

Mineralogical evolution of placed fluidized bed combustor ash for mineland reclamation will result in the development of a cementitious monolithic solid. Hydration reactions based upon the early formation of ettringite and gypsum can result in unconfined compressive strengths that vary, depending on the ash source, from a few hundreds of pounds per square inch to a few thousands of pounds per square inch. Extended hydration of these cementitious elements at elevated pH values further involves the reaction with dehydroxylated clays in the ash to form an amorphous hydrous calcium silicate phase similar to that found in ordinary Portland cement. This phase commonly identified in the cement literature as C-S-H, is the 'glue' that is responsible for the mechanical and chemical property of Portland cement concrete. The hydration products that formed from the reaction of FBC ash grouts with water have been identified in the laboratory, in field specimens, and most recently confirmed by thermodynamic modeling of the pore waters associated with placed ash. The conformation at this level allows for further modeling of placed monolithic cementitious solids in terms of Portland cement durability.

Submitted for presentation in the OSM Forum in the 2005 World of Coal Ash, April 11-15, 2005, Lexington, Kentucky, USA.