Coal Conversion Byproduct Diagenesis II

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ABSTRACT

When one disposes of cementitious coal combustion byproducts (CCBs) in a landfill, or employs individual or mixed CCBs in engineering works, the hydration mineralogy may change substantially with time. By analogy to mineralogy changes that occur in buried sediments, this phenomenon is referred to as *CCB diagenesis* [see *Fuel*, **76** 697 (1997)]. Diagenesis will affect the chemical and physical properties of the material. In Part I, presented at the 1997 Symposium, results from five CCBs disposed at four sites in the USA were summarized. The objectives of our current work are: (1) to develop improved methodology for quantitating mineralogy of these complex crystalline phase assemblages, and (2) to investigate the phenomenon of CCB diagenesis further by studying materials recovered from landfills or civil engineering works.

Hydrated CCBs are chemically and mineralogically complex, which makes quantitative mineralogy determination by conventional X-ray diffraction unusable or unreliable. The whole-pattern Rietveld quantitative X-ray diffraction (RQXRD) method, however, seems ideally suited to improve reliability. We have developed RQXRD protocols that can deal with mixtures of a dozen or more or CCB crystalline phases, and tested them with standard mixtures.

We will describe the mineralogy of CCB materials recovered from four additional sites:
(1) Landfill of FGD material from a Midwest utility burning subbituminous coal – up to 5 years old;
(2) Landfill of a Class F fly ash from a utility in Kentucky burning bituminous coal [cooperative work with a consortium of entities headed by the USGS] – up to 20 years old;
(3) Landfill of Class C fly ash and FGD material from a North Dakota utility burning lignite – up to 20 years old;
(4) Road embankment in Indiana constructed with a mixture of CFBC and stoker ash materials – up to 5 years old.

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