Relation Between Coal And Fly Ash Mineralogy, Based On Quantitative X-Ray Diffraction Methods

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ABSTRACT
The proportion of amorphous or glassy material in a series of fly ashes has been evaluated by X-ray powder diffraction (XRD) using several different sample preparation and processing methods in conjunction with the Rietveld-based SIROQUANT quantitative X-ray diffraction analysis software package. The results of the different methods used were found to give consistent results and were also in agreement with published data for a reference fly ash sample.

Comparison to the mineral matter in the respective feed coals showed that the relative proportions of quartz in the LTA of the feed coal and in the fly ash are strongly correlated to each other, suggesting that the much of the quartz in the coal tends to pass directly into the fly ash, without significant alteration. A similar comparison for the iron minerals in the coal and fly ash shows a more scattered but still broadly linear relationship between the percentage of iron oxide minerals in the fly ash and the percentage of siderite plus pyrite in the LTA of the corresponding feed coal, suggesting that the iron oxide minerals in the fly ash are derived mainly from the iron minerals present in the coals themselves.

Calculations based on subtracting the inferred chemistry of the crystalline minerals in the fly ashes from the total fly ash chemistry were also used to estimate the overall chemical composition of the glass fraction in the fly ashes and show that ashes derived from lower-rank coals have different glass compositions to those derived from higher-rank (bituminous) materials.

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