

Characterization of Adsorption on the Organic and Inorganic Phases of Fly Ash by Adsorptive Isotherms

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ABSTRACT

Air entrainment variations in concrete due to unburnt carbon in fly ash continue to contribute to technical and marketing difficulties in the utilization of fly ash in concrete. Consequently, our ongoing research in this field has focused on two objectives. The first is to develop a field test designed to more accurately predict the impact of the unburnt carbon on air entrainment properties. The second is to develop a better understanding of the nature of adsorption of air entrainment admixtures on the organic and inorganic phases of fly ash so that measures can be taken to alleviate the problem. This study utilized UV spectroscopy to monitor the changes in concentration of surfactants in solution upon exposure to fly ash. These data were used to generate adsorption isotherms. Many of the adsorption characteristics revealed by UV spectroscopy show good correlation with BET surface area and Foam Index (FI) testing provided adsorption onto both the inorganic and the organic phase (carbon) is considered. The isotherms also indicate that the adsorption characteristics of carbon are affected by heat treatment (in air) of the fly ash. Typically FI, BET surface area and carbon content correlate well with the adsorption data over a range of temperatures from ambient to 750°C. However, at temperatures around 250°C the adsorption data correlates well with FI, but not with BET surface area or carbon content. This thermal treatment does not seem to affect the adsorption characteristics of the inorganic phase.