A Chemical Approach to Reducing Variations in Fly Ash with Respect to Air Entrainment of Concrete

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The primary application for coal fly ash has long resided in the cement and concrete construction markets. This trend is likely to continue into the foreseeable future, however increased market penetration will be limited by issues of fly ash quality. The most prominent quality concern is related to variability of fly ash with respect to its influence on the air entraining properties of concrete and cementitious products. This well known phenomenon is related to the quantity and activity of residual carbon found in fly ash. In response to these challenges a number of fly ash beneficiation processes have been developed and promoted. These technologies address the issues of high or variable carbon content by reducing the overall carbon concentration or reducing carbon activity. Reported herein is a new approach to limiting the influence of fly ash carbon on air entrainment of cementitious systems. This technology involves introducing a group of proprietary chemicals to the concrete mixture. The chemical formulations developed by the authors exhibit little tendency to entrain air when used alone, and have little influence on the performance of other chemical admixtures, yet it strongly reduces the impact that fly ash carbon has on air entrainment in cementitious systems. Due to this unique combination of properties, this technology differs from other proposed chemical additives in the fact that the agent presents no danger of producing excessive air contents if accidentally over-dosed. The technology is also flexible in its means of application. Laboratory test results from fresh and hardened concrete with a variety of fly ashes at varying carbon contents will be presented that demonstrate the effectiveness of this new fly ash carbon treatment technology. Performance data collected from full-scale field demonstration projects will also be presented.