Use of High Carbon Fly Ash in Production of Cellular Lightweight Concrete

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ABSTRACT

Fly ash with a high content of carbon cannot be used in regular concrete because of its effects on air entraining and durability of concrete. Several techniques have been reported for the removal of carbon in fly ash. The removal of carbon from fly ash usually requires some special equipment and results in additional costs to fly ash. Thus, the direct use of high carbon fly ash in the manufacture of concrete will be more much attractive than the carbon removal techniques.

Advanced Materials Technologies, LLC in Hamburg, New York and CJS Technology Inc. in Ontario, Canada have developed a technology to manufacture non-autoclaved cellular lightweight concrete using high carbon fly ash without any pretreatment on fly ash. Laboratory studies have indicated that up to 50% cement can be replaced with high carbon fly ash, depending on reactivity and carbon content of the fly ash. The cellular lightweight concrete products manufactured with fly ash, which contains around 30% carbon, can be designed with a compressive strength ranging from 400 to 3000 psi and a density ranging from 40 to 90 lb/ft^3. High carbon fly ash based cellular lightweight concrete shows much better thermal insulation properties than regular concrete. The cellular lightweight concrete has very high flexural strength, impact resistance, and can be sawed, cut and nailed like woods. It is very suitable for manufacturing wall, roof and floor panels. A further study will be focusing on the effects of high carbon fly ash on fire performance of those products.