

# Hydration of combustion ashes - A chemical and physical study

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KEYWORDS: ashes, hydration, combustion

## ABSTRACT

The curing of mortars in which coal ashes, including FBC ones, were the sole binder components, has been studied. The work is focused on the hydration products. The hydration results were correlated with the physical properties of the cured beams.

Eleven formulations of mortar were made of sand and ash blends. Curing was extended to two to four years. Mechanical strength and dimensional stability were tested periodically. Beam specimens were cured in water for swelling measurements and in moist atmosphere for shrinking measurements. Complete textural porous matrix was also studied.

Separation by density of powdered samples was performed to obtain the light fractions containing the hydrates formed. These separated fractions were analysed by standard chemical methods, XRD, QXRD, SEM-EDX, TGA, DSC. The identified hydrates included AFt, gypsum, portlandite, a variety of hydrated calcium aluminosilicates and amorphous C-S-H. The composition of C-S-H, characterized by atomic ratios of various elements referred to Ca indicated considerable replacement of Si by Al, S and Fe. The degree of hydration, as indicated by the percentage of light fraction in the mortar, and the chemical characteristics of the ash blends (defined by an index relating silicoaluminous to sulfocalcic components) were related to physical properties of the cured mortar.