Fly ash generated from coal-fired power plants is increasingly used as a replacement for cement in concrete mixes. The advantages include lower cost since fly ash is essentially a waste product, and reduction of CO₂ emissions per cubic foot of concrete due to decreased cement consumption. Furthermore, fly ash can contribute to greater long-term strength development and increase concrete durability due to pozzolanic reaction.

The characteristics of fly ash depend both on the composition of the coal from which it originates, as well as the characteristics of the power plant boiler and the conditions of burning. Collection and storage conditions may also affect the characteristics of ash. This leads to a high variability of fly ash composition.

Over 50 fly ash samples from around the globe were analyzed using x-ray fluorescence, x-ray diffraction and other techniques with the goal of understanding the correlations between composition and performance properties.

The pozzolanic reactivity of fly ash is believed to originate in the glass phase (amorphous content). The diffraction patterns were analyzed for amorphous content using an external standard method first proposed by O’Connor and Raven [Powd. Diff̎r. 1988]. Refinements to the method are discussed, including choice of external standard material and influence of x-ray fluorescence background due to iron content.

Statistical analysis shows a mean amorphous content of 72 wt.-% and a spread of 43 to 95 wt.-%. Additional results will be shown.