

# ML 10

## POLYMER COLLOIDS IN CEMENTITIOUS APPLICATIONS

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Polymeric colloids are used as additives to improve flexibility, adhesion, hydrophobicity and workability of cementitious formulations in the construction industry. Water soluble (bio)macromolecules are known for centuries to modify both workability/rheology and water retention of mortars. In modern times, synthetic polymeric latexes and powders are added in order to combine the strengthes of an inorganic and a polymeric binder system with respect to adhesiveness and final material flexibility. The advantages of polymers in powdered form will be discussed.

Water-dispersible polymeric powders for cementitious formulations consist of at least three major components: i) the polymer binder itself; ii) approximately 10 % of a water soluble polymeric compound to make the powder easily dispersible in water; and iii) another 10 % of a hard granular anti-caking material to prevent the softer polymer particles from sticking to each other. Most of the commercially available polymeric powders contain poly(vinyl alcohol) PVOH as the water soluble component. PVOH dissolves immediately in a freshly prepared mortar thus influencing cement hydration from the early beginning due to its possible adsorption on cement grains and altering of ion dissolution and transport phenomena. In contrast, the anti-caking material is more or less inert in the mortar whereas the polymeric binder may cover and connect both cement grains and filler particles after polymer films have been formed. The polymer itself as well as the water-soluble protective colloid interfere with the cement clinker material during hydration and setting of the formulation. Water soluble polymers may complex Calcium ions in the aqueous phase or poison nucleation of hydrate crystals at grain surfaces. The influence of polymer colloids on hydration kinetics and application properties of cementitious formulations will be discussed.