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Polymers and Cement?

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POLYMERS & CEMENT

Polymer: a substance consisting of molecules that are composed of a species of atoms that are repeated in multiple chains. (Kumar and Partha)

Modern cement is frequently modified with polymers for optimum quality. (Wekumbura, Sastana, Zancata)

Polymer Cement Composite: a cement that contains a polymer and an aggregate. (Kumar and Partha)

Attachment in polymer cement composite is the bonding between the polymer phases. Hydrogen bonding, acids, and bases, charge transfer complexes, basic groups, etc., can be very sufficient for adhesion. (Kumar and Partha)

Compared to the basic cement, the polymer addition creates a stronger structure, and has more resistance to stress and temperature changes. (Wekumbura, Sastana, Zancata)

Overall, the basic cement without a polymer mixture had the lowest setting point at 34.8°C and the lowest viscosity at 1350 with 275 MPa, while the cement with the RC10 had the highest setting point at 74.4°C and the highest viscosity of 1,874 MPa. (Wekumbura, Sastana, Zancata)

Generally, the polymer modification had the higher setting point and viscosity. (Wekumbura, Sastana, Zancata)

Overall, the polymer modified cement obtained a higher shear stress overshoot than the basic cement. (Wekumbura, Sastana, Zancata)

Benefits: higher temperature resistance, fatigue and crack reduction, stability, etc. (Wekumbura, Sastana, Zancata)

Glass transition: The point where the polymers lose their chain structure and become rigid glass. (William Reusch)

Polymer: a substance consisting of molecules that are composed of a species of atoms that are repeated in multiple chains. (Kumar and Partha)

The words "polymer" and "macromolecule" are Greek. Poly means many, more so as, and macro meaning large. (William Reusch)

Polymer used as admixtures can advance the reduction of water absorption, strength, and the binding of cement to reinforce structures and materials. (Chang)

Polymers are used to make flexible films, adhesives, plastics, etc. (William Reusch)

With varying temperatures (heating or cooling) with polymers, they go into a thermal transition allowing insight into their morphology (melting transition, Tm / glass transition, Tg). (William Reusch)

Melt transition: The point at which polymers lose their structure and melt. (William Reusch)

"When the polymer rich phase becomes the continuous phase due to the relatively higher fraction of medium polymer, the medium chains remain together by dematting or ordering and form a three-dimensional network. The network is considered to be significantly affect the mechanical properties of the binder and ultimately the asphalt concrete mixture." (Wekumbura, Sastana, and Zancata 227).

Has been known to erode over time, have low tensile strength, temperature deterioration, erosion caused by chemicals, etc. (Boukht and Ismailoglu)

However, with these concerns with basic cement, everyday lives are at risk. (Boukht and Ismailoglu)

Unmodified cements are caused by the breakage of weak molecular associations through shear stress. (Wekumbura, Sastana, Zancata)

Cement: a powdery material, is a mixture of naturally occurring argillaceous (aluminous) and calcareous (containing calcium carbonate or lime) materials to a partial fusion at high temperature (about 1450°C). (Kumar and Partha)

Importance for highways, bridges, buildings, tunnels, sidewalks, etc. (Boukht and Ismailoglu)