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# Nanostructure and Adhesion of Cement/Polymer Fiber Interfaces

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**Abstract :** Concrete is the most used materials in the world. It is also one of the most versatile while complex materials which human have used for construction. However, concrete is weak in tension, over the past thirty years many studies were accomplished to improve the tensile properties of concrete (cement-based materials) using a variety of methods. One of the most successful attempts is to use polymeric fibers in the structure of concrete to obtain a composite with high tensile strength and ductility. Understanding the mechanical behavior of fiber reinforced concrete requires the knowledge of the fiber/matrix interfaces at the small scale. In this study, a combination of numerical simulations and experimental techniques have been used to study the nano structure of fiber/matrix interfaces. A new model for calcium-silicate-hydrate (C-S-H)/fiber interfaces is proposed based on Scanning Electron Microscopy (SEM) and Energy-dispersive X-ray spectroscopy (EDX) analysis. The adhesion energy between the C-S-H gel and 2 different polymeric fibers (polyvinyl alcohol and polypropylene) was numerically studied at the atomistic level since adhesion is one of the key factors in the design of fiber reinforced composites. The mechanisms of adhesion as a function of the nano structure of fiber/matrix interfaces are also studied and discussed.

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