

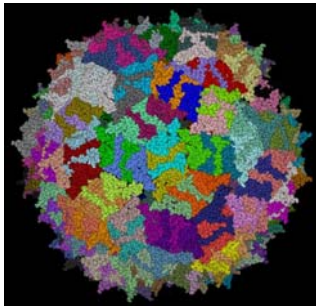
Textile Reinforced Concrete Systems

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The use of fabric reinforcement (“textile reinforced concrete”, TRC) has been the subject of intense R&D effort to produce high performance cement composites with controlled geometry that could enable new building systems. Modern textile technology offers a wide variety of fabrics made by different methods. The optimal choice in each case should take into consideration the particular application, the anticipated loading magnitude and the loading type.

Most fibers for textile applications are in the form of multifilament bundles. The use of multifilament reinforcement for cements has numerous advantages, however, there is an underlying issue which is the result of the particulate nature of the cementitious matrix and the multifilament nature of the reinforcement: the cement particles can not easily penetrate in between the filaments in the strand. This results in a reinforcing unit in which the external filaments (sheath filaments) are in intimate contact with hydration products of the cement matrix and therefore are well bonded to the matrix, whereas the internal filaments (core filaments) are relatively free. This leads to unique failure mechanism, a telescopic mode of failure, where the outer filaments are fractured during loading whereas the inner filaments pulled out during loading. In some cases improved cement penetrability in between the filaments can lead to high strength along with brittleness of the composite as reported for aged GFRC, however, in other cases good penetration can highly benefit composite performance: strength, ductility and toughness.

The penetrability of the matrix into fabric structure and especially in between the filaments made up the fabric depends upon the nature of the fabric junctions and the resulting tightening effects, the number of filaments in the bundle, and the production process of the composite.

These penetrability concepts and their effects on composite performance of textile reinforced cement systems will be discussed.