

Ultra-High Performance Cement Composite 1999 NOVA Award Nomination 27

Reactive Powder Concrete-- Ultra-High Performance Cement Based Composite

Reactive Powder Concrete (RPC) is an ultra-high-strength, high-ductility, low-porosity cementitious composite material with advanced mechanical and physical properties. It is made from customary concrete components that are selected for specific chemistry and particle size. RPC can be mixed and placed under normal construction conditions and engineered to address specific casting requirements. RPC was first developed in the early 1990s by researchers at Bouygues' laboratory in France. RPC stems from efforts to optimize the microstructure of the concrete matrix by precise gradation of all the mix particles to yield an optimum density, and by extensive use of the pozzolanic properties of highly refined silica fume to optimize the Portland cement chemistry and produce the highest strength hydrates. RPC represents a new class of Portland cement with compressive strengths in excess of 200 Mpa. By introducing fine steel fibers, RPC can achieve remarkable flexural strengths up to 50 Mpa. The material exhibits high ductility, and has typical values for energy absorption capability that are comparable to those of some metals. RPC technology can create materials that extend from those with traditional heterogeneous characteristics normally associated with concrete to more homogeneous materials that have isotropic properties and energy absorption capabilities that approach the characteristics of metals.

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