

GRC in the past and in future

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Summary

Glassfibre-reinforced concrete is almost certainly the most complex material used in construction practice. It is a composite in which both the matrix and the reinforcement are very complex composites themselves. To make it yet more complex, its internal microstructure together with external properties change with time, in a non-linear way. Understanding of the behaviour of GRC therefore presents a great challenge to all involved, from researchers in fundamental materials science to manufactures of GRC products, from structural engineers who exploit the high performance, of GRC, to architects who enjoy its outstanding freedom of shape size and colour and positive contribution to better environment.

A brief review of key stages in past development of GRC is presented, followed by an outline of significant advances expected in both near and more distant future. GRC is benefiting more from advances in nanotechnology than probably any other construction materials. It is becoming possible to measure key parameters of GRC microstructures, moving closer to a stage when such parameters can be controlled, eventually pre-selected and the internal structure then tailored to provide different external properties of GRC.

Novel nano-scale techniques have opened up R&D pathways to unlocking of the already well established potential for a simultaneously stronger and tougher GRC. Exploitation of nano-scale 'design' of molecules has led to novel admixtures, which allow fresh mixes with glass fibres to be self-compacting when required. Greater activity of many materials when produced in nano-size particles is well demonstrated by titanium dioxide, which, added to the cementitious matrix produces GRC building envelopes, which possess enhanced 'self-cleaning' capability and reduce significantly the concentration of many pollutants in surrounding environment.

The GRC is already a 'high-tech' and environmentally positive construction material, however, its complex internal structure, fracture mechanism and behaviour still offer significant challenges for targeted research and development and provide a wide scope for additional commercial exploitation of an even better GRC.

Keywords: GRC, behaviour, construction, nano-scale, nanotechnology.