IT'S A MATERIAL WORLD

Exciting new developments in building materials – some already in production, others still at the research stage – look set to change the buildings of tomorrow. We take a quick look at nine that could bring big changes to the building industry.

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The worldwide building materials industry is in a state of rapid change as a result of two key drivers: the increasing demand for green buildings coupled with practical applications of advances in material science.

Increasingly, a new building needs to be efficient in its use of resources – whether by using recycled materials or less raw materials or by incorporating energy-conserving materials.

Materials that clean, shine and warm

Advances in material science, particularly nanotechnology, are delivering materials that are green, cost-effective and remarkably efficient. Today, new materials – some of which sound like they've emerged from the pages of science fiction – are able to provide buildings with wonderful new properties in terms of cleanliness and energy efficiency.

Many of these materials are already being used and will potentially soon be seen in New Zealand. Others are still under development. Regardless, buildings, and the materials they are made from, will be very different in 20 years' time than they currently are.

We look at nine technologies and their practical applications, some of which are already changing the building materials industry.

1 Coatings that reduce atmospheric pollution

Nanoparticle coatings for buildings that can reduce pollution are available now. Rome's Jubilee Church can reduce the surrounding air pollution due to the photocatalytic titanium dioxide nanoparticles on the surface of its precast concrete wall panels. The church also benefits, as the photocatalyst helps the walls stay clean.

BRANZ research has identified cost-effective photocatalyst materials and proved the effectiveness of the processes needed to make these catalysts. It's predicted that they will give better performance and be cheaper to manufacture, operate and maintain than conventional titanium dioxide photocatalytic materials that require a high ultraviolet (UV) irradiance to work well. BRANZ has applied for further research funding to continue the development of these materials.

A sculpture made from thermobimetal.

2 Photovoltaic coatings

Scientists are working on coatings that can harness the sun's energy for conversion to electricity. The coatings uses tiny dye-sensitised solar cells that work in a similar way to traditional silicon solar collectors.

3 Walls that light themselves

Graphene is a one-atom-thick board of bonded carbon atoms. Scientists have integrated this material into light emitting electromechanical cells (LECs) that, applied to walls or ceilings, could make the entire surface a light source.

Potentially, this light source could dramatically reduce power use.

4 Space-age aerogel insulation

Some high-tech materials have been around for a while but are now becoming more accessible to the building industry. Aerogel is a silicon-based solid with a porous sponge-like structure – it has the lowest density of any known solid. It has been used for years as an insulating material by the National Aeronautics and Space Administration, NASA.

Recently, the material has been engineered into flexible and blanket forms. These products are already finding uses in factory and pipeline applications. Other potential applications include insulation for interior walls, hot water pipe insulation and solar panels.

5 Strong and light structural nanomaterials

Carbon nanotubes are molecular-scale tubes of graphitic carbon. The nanotubes are extremely strong and have good thermal conductivity.

These tiny structures can be added to polymer matrices or metal systems as a filler or modifier to improve mechanical strength and impart electrical properties. Beyond coatings, emerging applications for carbon nanotubes in plastics include rotor blades for wind turbines and sports equipment such as skis, hockey sticks and surfboards.

6 Electrochromic glass

Electrochromic glass, which is already in production, can turn windows from transparent to opaque at the flick of a switch. The glass is coated with very thin layers of specially formulated metals that change their optical properties with electrical stimulation.