

Apartment made from waste glass and textiles showcases 'green' ceramics

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The kitchen splashback, the front of the island bench and the tubular light fittings on display in the apartment were manufactured using green ceramics. Credit: University of New South Wales

An industry-first apartment made using waste materials that has the potential to revolutionize home construction has been revealed by the

UNSW SMaRT Centre and industry partner Mirvac.

At the unveiling of the revolutionary Pavilions apartment at Sydney Olympic Park, attended by NSW Energy and Environment Minister Matt Kean, industry leaders had a glimpse into the future—flooring, wall tiles, kitchen and lighting features, and furniture and artworks, made from [waste glass](#) and textiles.

The 'green ceramics,' used for the first time as a [construction material](#), are the result of a collaboration that began in 2019 between Mirvac and the UNSW Centre of Sustainable Materials Research and Technology (SMaRT), led by UNSW Professor Veena Sahajwalla, a global pioneer in waste technology.

The first collaboration was a successful pilot project involving the NSW Circular Economy Innovation Network (NSW Circular), an initiative of the NSW government Office of Chief Scientist & Engineer and hosted by UNSW Sydney. The pilot demonstration site was at Marrick & Co, a state of the art Mirvac community living and apartment complex in the Sydney suburb of Marrickville. Display apartment furnishings were made from SMaRT Centre's green ceramics MICROfactorie technology. This next collaboration with Mirvac is part of the green ceramics commercialisation journey which is supported by funding from the NSW government's Physical Sciences Fund.

The Mirvac CEO and Managing Director, Susan Lloyd-Hurwitz, told the gathering of property, construction, design and sustainability leaders that it was time for the industry to find a more sustainable way to build.

"Every year, an estimated 11 billion tons of waste are sent to landfill globally. Ninety-two billion tons of materials are extracted, with buildings responsible for around 50 percent of global materials used," Ms Lloyd-Hurwitz said.

"In Australia, the building industry is responsible for around 60 percent of the waste we generate. At Pavilions, we have been able to demonstrate a better way to build, using reformed waste, which not only helps our industry but provides a valuable second life for the mountains of glass and clothing, much of which would otherwise find its way to landfill.

"The 'take, make waste' approach is no longer acceptable, and we are working hard to find a better, more sustainable way to provide Australians with homes and office buildings that are kinder to the planet.

"Our collaboration with Prof. Sahajwalla's team at the SMaRT Centre makes a valuable contribution to our Planet Positive strategy to send zero waste to landfill by 2030.

"Just as important, we are demonstrating to the broader industry that there are viable commercial and sustainable alternatives that can lead to a more sustainable future, where we consider the whole life cycle of the resources and materials we use in housing and construction."

Prof. Sahajwalla, who is the Director of the SMaRT Centre, said she was delighted that Mirvac was so committed to sustainability and she was impressed the company was prepared to take risks to find new purposes for materials that can end up in landfill.

"Mircvac is a true industry leader and I commend Sue and her team for being part of the journey to help society create a materials revolution where we start to think of, and treat and reform, waste as a renewable resource," Prof. Sahajwalla said.

"These very stylish and functional furnishings and products made in our UNSW SMaRT Centre green ceramics MICROfactorie show what can be done when science, technology and industry vision and commitment

come together."

The NSW Energy and Environment Minister, Matt Kean, said it was great to see Mirvac partnering with Prof. Sahajwalla and the UNSW team to help demonstrate the commercial potential of these ground-breaking 'green ceramics.'



A feature wall and lighting in the Pavilions apartment are made of recycled materials. Credit: University of New South Wales

"The innovative Pavilions partnership could be the blueprint for how we do sustainable development in the future," Mr Kean said.

"Diverting the large volumes of waste generated on construction sites from landfill to create quality finishes and furniture is not only good for our environment but good for the economy."

The NSW Chief Scientist & Engineer, Professor Hugh Durrant-Whyte, said the collaboration was proof of the success of the NSW government's Physical Sciences Fund, which supported the development and commercialisation of innovative NSW technologies.

"As successful recipients in the Physical Sciences Fund's inaugural 2019 round, UNSW Sydney received \$790,000 to assist in the development of commercial tiles from common waste products, for use in the built environment. I'm delighted that this funding has contributed to the new agreement between UNSW Sydney's SMaRT Centre and Mirvac, which will provide strong economic benefits while contributing to waste renewal and reuse in our state," he said.

The NSW Circular CEO, Lisa McLean, said: "NSW Circular is proud to have made this project possible through our support of the SMaRT Centre. This is a demonstration of our continued brokering of research, industry and public sector partnerships in support of circular economy innovation.

"Mirvac's leadership in partnership with this breakthrough innovation is catalyzing the market in an exciting way that gives a taste of things to come for the circular economy in Australia. It signals the start of a huge wave of circular economy innovation which we will see roll through every sector of our economy."

Mirvac's Ms Lloyd-Hurwitz said the company was ready to lead change

in the industry as it charted its own path towards zero waste.



The standing lamp is one of several light fittings made from materials that would have otherwise ended up in landfill. Credit: University of New South Wales

"We have an innovation culture that aligns well with the SMaRT Centre whose brilliant scientists and engineers have produced an entirely new built environment material from waste," Ms Lloyd-Hurwitz said.

"The importance of this collaboration cannot be overstated. To get the green ceramics from the lab to the marketplace it is imperative to first

get the product right and also establish that there is a market. To this end, SMaRT Centre provides the science and engineering smarts and Mirvac contributes expertise in design, development, construction and marketing.

"It took many months and trial attempts to create a product that is not only fit for purpose but meets the essential customer requirement of being beautiful and durable."

In 2019, Mirvac and the SMaRT Centre offered a first glimpse of the potential for green ceramics with the unveiling of the furniture and artworks at Marrick & Co, the first One Planet Living residential community in NSW.

The positive market response led to an expanded project scope at Pavilions, with green ceramics used for the first time as a construction material in a residential setting after complying with the Building Code of Australia and passing tests for slip and fire resistance and acoustics. It also met Mirvac design standards, proving its ability to stand up to normal household wear and tear.

The next stage in the SMaRT Centre collaboration is to investigate opportunities to establish a MICROfactorie to enable local sourcing and manufacture of waste into green ceramics. The SMaRT Centre is also assisting Mirvac on its other development sites in Sydney, identifying materials that can be diverted to recycling or reforming before demolition works begin.

A series of public and industry events and tours will be held in the Pavilions apartment over coming months to build industry awareness of MICROfactorie technology and draw attention to the need to reduce waste in construction.

UNSW Deputy Vice-Chancellor, Research and Enterprise, Professor Nicholas Fisk, said the collaboration with Mirvac and NSW Circular was a powerful demonstration of social and economic impact arising from government, industry and university research collaboration.

"Taking green ceramics to the next level where they can be used as construction materials that meet all of the rigorous standards that apply is a real achievement. A crucial partner on this commercialisation journey has been the NSW government's Office of Chief Scientist & Engineer which provided funding from its Physical Sciences Fund.

"We are starting to see the fruits of this commercialisation work and while there is still a long way to go we are delighted to be making progress and would like to acknowledge all of our partners who have been part of this journey."

About 'green ceramics'

The MICROfactorie process takes problematic [waste materials](#) and 'reforms' them into entirely new 'green ceramics' and other products for the built environment through a combination of heat and compression. In the Pavilions apartment, green ceramic tiles are used for the first time as a building material. All tiles are made from a combination of yellow-bin glass and textiles, both considered problem waste streams despite their inherent qualities. Green ceramics have been applied to flooring, kitchen splashback and island front, shelving, feature walls, artwork, light fittings and furniture.

Floor tiles unlike any other

The combination of two dissimilar waste sources—glass and textiles—in the MICROfactorie process creates an entirely new product that makes

the technology distinct from other recycled products which are typically turned back into themselves, for example, glass recycled to create glass, or PET plastics to create plastics.



The floor tiles and island bench tiles are manufactured using the MICROfactorie process. Credit: University of New South Wales

Glass is a strong material that loses none of its valuable properties and can be recycled or reformed many times over. Textiles provide the color and esthetic but also a technical addition, playing an important role in

meeting building standards.

The floor tiles used in the apartment have been tested for slip, fire and acoustic properties. They have a terrazzo look that can be controlled, to a degree. There is variability in the material which gives it its own grain and character, much like a piece of timber or natural stone. The character, grain or story is embedded in the green ceramic product.

Costs v. benefits

There is an energy cost to recycling waste but all materials have a level of embodied energy which, combined with transport, is often the most significant part of the impact of objects. When you eliminate transport and virgin materials manufacturing, you save large amounts of energy.

An important element of the MICROfactorie technologies is that they are designed to operate locally, collecting [waste](#) and manufacturing at source rather than large scale mass production, which adds unnecessary transport to the cost and energy equation.

Provided by University of New South Wales

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