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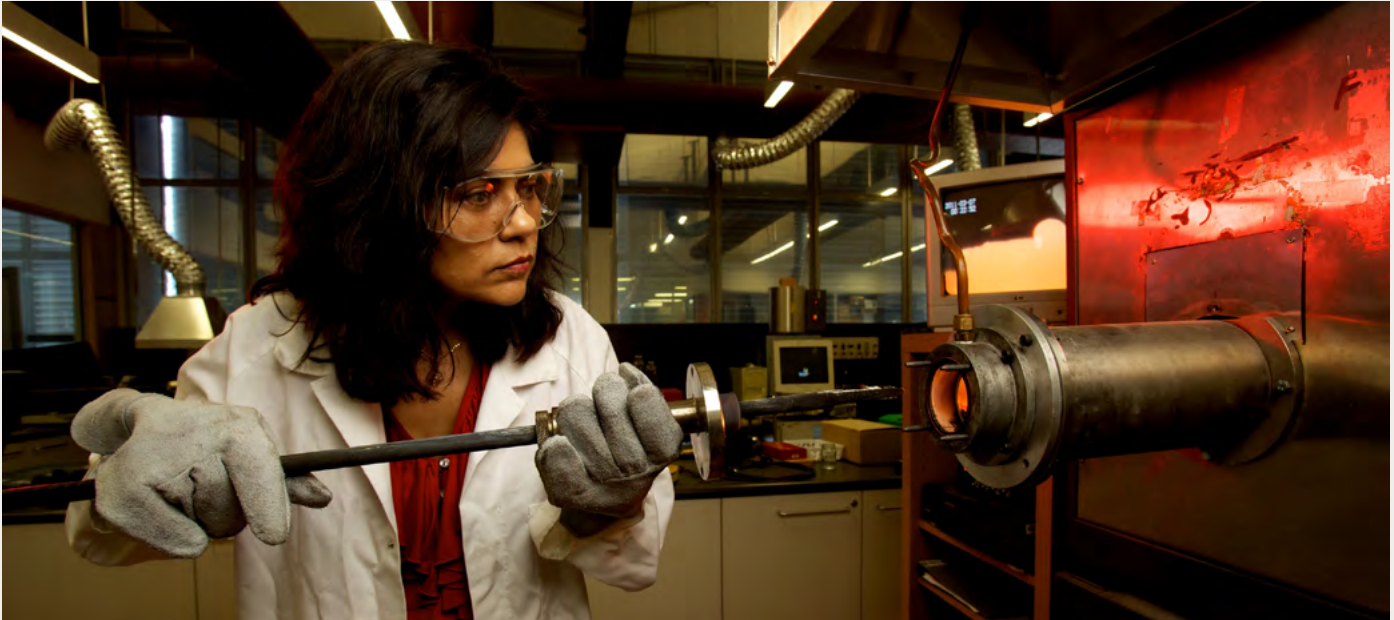
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## FROM WASTE TO PRODUCT: Designing a new solution to our waste crisis

WORDS Professor Veena Sahajwalla, UNSW Sydney



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UNSW's green microfactory converts glass, plastics and other waste materials into value-added products like 'green steel' and engineered stone products. Veena Sahajwalla, pictured, is a scientist, engineer, inventor and Professor of Materials Science and Engineering UNSW Sydney, Australia. She's the Director of the UNSW Centre for Sustainable Materials Research and Technology, Director of the NSW government's new Circular Economy Innovation Network and an Australian Research Council Laureate Fellow.

**Creating new materials from waste products is essential if we're to solve the global recycling, waste and emissions crisis - and some of the most cutting edge work is happening in the labs at the University of New South Wales.**

If they don't know it already, designers of all types will soon be at the forefront of a new recycling ethos in Australia and around the world.

For too long products of all kinds have been designed without consideration of the environmental consequences of their disposal. The burden of what to do with all of the unwanted items in our households has fallen to consumers and the local councils in the downstream part of the lifecycle of products via bin collections and waste sorting.

Many of these waste materials are ending up in landfill and generating damaging greenhouse gases, and if the world keeps doing this, the waste crisis currently being experienced in Australia since China last year and now India this year banned the importation of international waste, will become critical.

The reality is that much of the waste that ends up in landfill is actually a valuable resource. This has been proved in our labs

at the Sustainable Materials Research and Technology Centre at UNSW Sydney through our microrecycling science and in our prototype green microfactory technology.

For instance, we are producing building panels from old clothing and textiles, as well as from coffee grounds and cups, and even from glass and sawdust. We are also extracting from electronic waste such as printers, computers and mobile phones the valuable metal alloys they contain and from the plastics we can produce high quality filament for 3D printing.

And we need to do this if we want to achieve a circular economy: which minimises waste by ensuring that the valuable resources contained in waste and discarded products are kept in use for as long as possible. For instance, metals can be reformed over and over ad infinitum while glass and even plastics can also be reformed and re-used many times depending on quality.

But it is not just the designers of products in the so-called upstream part of our market places, it is the producers and manufacturers of their products and services in the 'mid-stream' that must also play a key role in creating a true circular economy.

A key problem is there is little commercial appetite to ensure we divert from landfill the waste that can be reformed into new, valued-added materials, products and manufacturing feedstock.

To that end, the NSW government has just announced in 2019 via its Office of Chief Scientist and Engineer, funding to be awarded to UNSW Sydney to establish the NSW Circular Economy Innovation Network, to which I've been appointed director.

There are so many stakeholders across all supply chains that the challenge is to work together to find the opportunities to make changes that not only reduce waste but to ensure it can be valued and used over and over as a 'renewable' resource.

If designers and producers of products, packaging and applicable services accounted for and built in, from the very beginning of the product lifecycle, a consideration for how all of these products will become part of the circular economy so they do not have to end up in landfill, then we may have a positive impact on addressing the world's growing waste problem. For example, using a modular design means that if a part of a product breaks, a replacement part could be made from 3D printing technology comprising filament made using recovered quality plastic, so the whole product is not binned.

Some designers and producers are now making products from waste resources that otherwise would have gone to the tip and produced greenhouse gases. High-end furniture is one example. In our labs, we work with various industry partners and one is Dresden which makes prescription glasses, but has a mission to do it sustainably using recycled and recyclable plastic materials. Our researchers are helping them by testing the viability of using plastics from things like discarded fishing netting, plastic bags and plastic lids.

The new Circular Economy Innovation Network will bring together key stakeholders and case studies to accelerate partnerships and opportunities to build the circular economy in NSW and address the waste and recycling issue, while enhancing manufacturing and industry capability.



↑ Professor Sahajwalla's team is partnering with Dresden, which makes spectacles, to aid their use of recycled plastics in their new low-cost frames.

Workshops, seminars and identifying market opportunities and new partnerships with researchers, industry and governments, will be key activities and I am excited to be leading this new initiative. It's a big challenge to create a network like this to bring together all of the touchpoints along business supply chains to help build a true circular economy, but we must act now for the future.

Let me give you some stark statistics and facts.

The clothing and textiles industry is the second most polluting sector in the world, accounting for 10 per cent of the world's total carbon emissions. That clothing is now one of the biggest consumer waste streams, with 92 million tonnes estimated to be thrown out in a year, means we must urgently and seriously consider new ways to deal with unwanted clothes.

Much of the materials collected from kerbside recycling bins has been going to developing nations and in Australia that gets ticked off as 'recycled', but much of it ends up in landfill or is burnt. And due to the Chinese and Indian waste importation bans, recyclable materials around Australia are being stockpiled and going into local landfill. Other Asian countries are also getting sick of being Australia's and the world's dumping grounds.

UNSW's own research shows 65.4 per cent of people believe recyclables put into council bins go to landfill (69.5 per cent female, 51.4 per cent aged 18-34, 75.1 per cent aged 65+); 49 per cent of people believe green and ecofriendly efforts will not have an effect in their lifetime; 63.8 per cent of those aged 65+ see no benefits being realised; and 72.4 per cent of people would recycle more if the material was reliably recycled.

So, when considering that the population growth trend is expected to continue in the following decades, from a current world population of 7.6 billion to approximately 9.8 billion by 2050, our resources globally and at home need to be preserved and re-used.

Smart design and production in a new circular economy can make a big difference. 🌱