

COST ING

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Ceramics are all too often ecologically unsustainable and toxic, but designers are exploring new materials and scientific techniques to find a more viable approach. Isabella Smith reports on clay with a conscience

EARTH



Craft is often seen as a harmless escape from the stresses of contemporary life: a wholesome antidote to mass production in a globalised world. When viewed through the lens of sustainability, however, it is not immune from criticism. Ceramic, with its often toxic metal glazes, use of non-renewable virgin materials and carbon-heavy kiln firings, is ripe for a radical re-think. Its problems are many and varied: the mining of china clay alone leaves behind nine tonnes of waste for every one tonne of clay extracted; shipping clay around the world comes at a heavy carbon cost; once glazed and fired to over 1,100° C, clay cannot easily be reused, nor will it biodegrade. Much is made of the environmental benefits of creating timeless objects that last, over trendy products that are rapidly replaced. Yet the pot – in its current form – is often guilty of calling the kettle black. As ceramics surge in popularity, finding greener alternatives is becoming increasingly urgent. And, as with many industries, the forced pause in production caused by the coronavirus pandemic has offered a moment of reflection: a chance to rethink our choices when it comes to what we do and how we do it.

A new breed of makers is showing the way by seeking more sustainable methods of working that revisit ceramic heritage, explore materials and techniques with a green edge, and even take a scientific approach. Many of the most imaginative ideas are emerging not from ceramics departments, but from non-discipline-specific courses such as Design Academy Eindhoven's 'Social Design' and 'Geo Design' MAs and 'Material Futures' at London's Central Saint Martins, which interrogate materials, processes and consumption habits. Ceramics departments are increasingly taking note. Lisa Hammond, potter and founder of Clay College Stoke – the UK's only ceramic-specific institution – highlights the need for embedding eco-consciousness into students' work: 'We've got to make the next generation aware of these issues, so they think about how they practice in the future,' she says. Thankfully, makers are starting to unpick every aspect of ceramics – from sources of clay to firing options – to find greener ways of working.

CLAY

We seldom think of clay as a finite resource that poses ecological problems. But industrial-scale clay mining leaves landscapes scarred and barren once clay deposits have been exhausted. Using local clays – an ancient practice that continues today – eliminates much of the carbon footprint of transporting raw materials and, with global supply chains disrupted by COVID-19, the benefits of going local have become all the more apparent. But many makers are exploring ways to limit the use of virgin materials – sometimes eschewing them altogether – in order to reduce the impact on the landscape.

'We can't continue pretending natural resources are endlessly available,' says Dutch ceramic designer Lotte Douwes. 'Porcelain clay won't be available forever, so we need to be aware of how precious it is.' The Design Academy Eindhoven graduate travelled to Jingdezhen, the Chinese city synonymous with porcelain production, to research the material. She discovered that almost half the porcelain produced there goes to waste. 'If we want to build towards a sustainable ceramic



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LOTTE DOUWES



Previous page: satellite image of red mud (bauxite residue), a by-product of the aluminium industry. Clockwise from top left: coaster from 'Shadows of Light: Circular Collection' by Lotte Douwes; 'Red Mud' tableware by Studio ThusThat; waste products used by Granby Workshop; 'Granbyware' plates made of 100 per cent recycled ceramic



future, the chain should become circular so new materials aren't needed,' says Douwes. 'I decided to find a way to use every part of the porcelain within the same production cycle.' *Shadows of Light: Circular Collection* is her response: minimal cups, vessels and plates in soft greys, off-whites and pink. She grinds shards left from making her tableware to a fine powder, using it for slip-casting instead of pure white kaolin clay – limiting the use of virgin materials, while retaining porcelain's legendary translucency. It's easy to imagine this approach being scaled-up in future.

One of fired clay's virtues is its sheer longevity – from prehistoric potshards to cracked contemporary crockery, ceramic endures for millennia. In our age of ever-expanding landfill sites, however, this is a problem. It's an issue the Liverpool-based Granby Workshop tackled head-on with *Granbyware*, the world's first 100 per cent recycled ceramic tableware – other attempts, they say, all used some kind of



virgin binder. 'We'd done reuse projects like *Granby Rock*, using waste material, but we wanted to avoid using even the tiniest bit of primary materials,' says team member Lewis Jones. The studio developed a process to create dinnerware made entirely from ceramic, glass and stone waste.

'We began by talking to waste management companies and looking at post-consumer and industrial waste in the North West and the Midlands,' Jones says. 'We then looked at the usual properties of our raw clay and glaze ingredients, and tried to reverse-engineer them using waste materials.' After much trial and error, they succeeded in transforming crushed glass, factory sludge and broken pottery from landfill fodder into plates, bowls and mugs. Exteriors are left bare to show off the nut-brown clay body, while interiors are glazed in speckled blues, greens and neutral hues. This is a painstaking process, but one which, if adopted on a wider scale, could alleviate potters' dependence on virgin materials. 'We're thinking about selling the clay or glazes as products,' Jones adds.

Other designers and makers are also interrogating industrial processes to find new sources of materials. One industry crying out for ecological intervention is that of alumina production: 150 million tonnes of red mud (also known as bauxite residue) is created worldwide every year as a by-product, leaving vast lakes of hazardous waste. Rainwater causes the highly

alkaline mud to spread, causing environmental damage. A dam containing red mud collapsed in Hungary in 2010, killing and harming both people and wildlife, while its high pH affected ecosystems. 'Figuring out what to do with all this red mud is a hot topic,' says Kevin Rouff of Studio ThusThat, a group of Innovation Design Engineering MA graduates from London's Royal College of Art. 'In Europe, they don't allow any industrial use of this material, so responsibility falls on people like us who can experiment more freely, unlimited by corporate regulations.' Studio ThusThat transformed the toxic by-product into a material for potting, debuting with *Red Mud*, a collection of slip-cast tableware in sleek, minimal designs.

'It's important to encourage people to see the inherent beauty of waste materials,' says Rouff. 'Our decision to make tableware was a provocation – we knew that people would freak out about eating off it.' Chemically speaking, red mud is similar to ball clay: once fired, pieces are dense and textured, the iron content creating warm hues ranging from terracotta to aubergine. The group struggled to bring their idea to life, however. The RCA forbade the use of the toxic mud in its workshops, forcing them to work in collaboration with factories, research labs and ceramicists. Now developed, the *Red Mud* collection offers a model for future production – making use of an abundant material and alleviating an industry's waste crisis.

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Kucerenkaite photo: Nicole Mannathby © DAE



Opposite: ceramic tableware from Studio ThusThat's 'Red Mud' series, made from bauxite residue. Right: Agne Kucerenkaite with objects from her 'Ignorance is Bliss' series of porcelain pots, glazed using waste heavy metals



From top left to right: Agne Kucerenkaite's glaze research tiles, using pigments made from industrial metal waste; 'Karipot' from Tiipoi's 'Longpi Cookware' range, made from river clay and serpentine; Sinae Kim filtering residual solids of human urine to create ceramic glazes for her 'Urine Ware'

GLAZES

The same materials that create colourful, alluring glazes can have an altogether uglier effect. From metal oxides and lead to barium – better known as a rat poison – ceramic glazes can include substances that, when washed down studio drains or dumped in bins, create noxious pollution. The mining of virgin materials for glazes also comes with its own ecological issues.

Avoiding unnecessary mining is one positive step. Agne Kucerenkaite, a ceramic designer working between Holland and Lithuania, has found alternative metal oxide sources in the refuse from industries, including leather production and the drinking water supply. According to Kucerenkaite, providing drinking water for just one town creates around 10 tonnes of iron waste per month – a huge untapped resource. Her ongoing *Ignorance is Bliss* project uses such waste in pigments for tiles and tableware. The result is a spectrum of glazes, ranging from iron-rich reds, browns and blacks to copper greens. 'My aim is to show that waste is not a limitation, but an opportunity,' she says. Glaze expert and Forest Row School of Ceramics tutor Linda Bloomfield adds: 'There's currently no transparency about where suppliers source glaze ingredients – cobalt is often mined by children in the Congo, for instance. But it's difficult to make a dent in such a large amount of waste, unless the idea gets picked up for a big commercial tableware project.'

South Korean maker Sinae Kim has taken a more eccentric approach to glazing. 'Urine is considered waste, but it can be really versatile,' she says. While studying for her Material Futures MA at Central Saint Martins, she collaborated with a scientist and they discovered that, when distilled through evaporation then fired at a high temperature, urine's urea and mineral content creates a glossy, opaque ceramic glaze. Her *Urine Ware* collection of ceramic vessels is glazed with urine, with forms inspired by bladders and laboratory flasks. It required 280 litres collected over five months, and wasn't a welcome prospect on university grounds. 'I couldn't get access to workshops because of hygiene issues, so I used my backyard to distill the urine.' Despite the material's abundance, public squeamishness and the difficulty of collecting and storing it mean we're unlikely to find urine-glazed bowls on our tables soon. For now, *Urine Ware* remains a provocative statement on the breadth of sustainable alternatives awaiting discovery.

At the more palatable end of the spectrum are glazes created from abundant and renewable wood ash. Ash glazes are a time-



Kim photo: Tom Mannon

'The fact that they are made from a single material, thereby allowing them to be returned to the earth, is why we can truly call this collection sustainable' SPANDANA GOPAL

honoured tradition originating in ancient East Asia, and one that rural British potters such as Jim Malone and Phil Rogers and their East Asian counterparts continue to explore, while a new generation of makers – such as Robert Hunter and Natalia Kasprzycka – are using ash glazes in fresh, contemporary ways. However, one drawback is the necessity to high-fire work, thereby increasing its carbon footprint.

Elsewhere, South Korean designer Yoon Seok-hyeon (another Eindhoven graduate) is experimenting with lacquer. He applies a resin historically used to varnish wooden objects to his pots (see *Crafts* no. 282, Jan/Feb 2020). The benefits? There's no need to glaze-fire pieces, which saves electricity, and lacquered pots can be recycled as grog to fortify clay.

FIRING

Firings are a significant problem, thanks to the carbon impact of heating a kiln to temperatures as high as 1,300° C. 'My firings double what would be a normal household's electricity usage,' says Linda Bloomfield. 'You can switch to a green supplier, but using a lot of power is still unavoidable.' Experiments with eco-alternatives – solar-powered kilns, or even bicycle-powered kilns as proposed by American ceramicist Aaron Nelson – are in their infancy. High-pressure sintering, in which powdered clay is compressed at room temperature in lieu of firing, is one option being explored in the manufacturing industry.

Past ways of making can offer solutions: the influential 20th-century potters Michael Cardew and Bernard Leach both advocated for the use of local materials and the avoidance of waste, while promoting low-fired earthenware. Low temperature firings (up to 1,080° C), which come at a lesser cost to the climate, have been used globally from prehistory to the present day. Surprisingly, wood-firing is considered between 75 per cent and 100 per cent carbon-neutral: the same amount of carbon the tree absorbed during its lifetime is released back into the atmosphere. Of course, the practicalities of wood-firing make it almost exclusive to makers in rural areas.

Low-fired earthenware is more fragile than high-fired stoneware, but is durability the goal? Not for Spandana Gopal, founder of London- and Bangalore-based design studio Tiipoi. 'Indestructibility is not necessarily synonymous with good,' she says. For its *Longpi Cookware* collection, the studio looked to the craft traditions from the Manipur region in north-eastern India, where low temperature firings are the norm. Working with craftsman Matthew Sasa, Tiipoi refashioned the local black earthenware pottery, formed of serpentine stone and clay from the Shungvi Kong river, into a design-conscious range, burnished to avoid the use of either non-stick chemical coatings or glazes, meaning the pieces will eventually biodegrade. Gopal adds: 'The fact that they are made from a single material, thereby allowing them to be returned to the earth, is why we can truly call this collection sustainable.'