

<p>Institution: University of Central Lancashire</p>
<p>Unit of Assessment: UOA 34 Art & Design: History, Practice and Theory</p>
<p>Title of case study: Creative and technical research into silicates-based materials</p>
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>Projects within the Silicates Research Unit have expanded the aesthetic and technical boundaries of ceramic materials and have had a significant impact on sustainable practices and materials within contemporary design. In response to increasingly stringent sustainable construction legislation, an AHRC Grant (£163,000) funded Binns and Bremner's development of a unique process for converting low-value mineral waste into high-value architectural products, avoiding reliance on non-replenishable materials.</p> <p>Testing by the Environment Agency National Testing Laboratory has verified their innovative material meets British Standards for architectural materials (UK patent application, currently pending publication). It has also confirmed that the incorporation of Cathode Ray Tube (CRT) lead bearing glass (designated by the Environment Agency as hazardous waste) in the new material results in the lead content being safely encapsulated, offering a solution to the global problem of hazardous CRT waste glass recycling - allowing CRT glass to be re-classified as a safe raw material.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>This case study outlines research undertaken both individually and in collaboration by David Binns (Reader in Contemporary Ceramics) and Dr Alasdair Bremner (Post-Doctoral Fellow). Since 2004, Binns' research has involved developing processes for adapting ceramic bodies through the inclusion of aggregates, in order to enrich the visual properties of unadorned clay bodies. Bremner's research into refractory concrete explored how this industrial material can be successfully utilised in the production of objects for design-led applications, combining the functionality of concrete with the considerable surface possibilities of ceramics. Both bodies of research have challenged conventions within the fields of contemporary ceramics and architectural embellishment, increasing the range of creative possibilities available to practitioners, broadening the aesthetic vocabulary and increasing the potential for more sustainable practice.</p> <p><u>Environmental Impacts.</u></p> <p>Since 2007, Binns and Bremner have collaborated on a number of projects, informed by concerns about the environmental implications of excessive mineral consumption within the construction industry (Binns, 'WASTE & PLACE', 2011). The research has involved sourcing and combining a wide range of low-value recycled waste materials, resulting in an high-value material imbued with both unique aesthetic properties and significant 'sustainable characteristics' that utilises ceramic waste from the tile and sanitary ware industry, quarry waste and waste container glass, materials often currently consigned to landfill. The material is appropriate for a number of architectural applications, such as cladding, facing bricks, tiling systems and counter-surfaces. Tests by CERAM have shown the material meets the necessary British Standards for internal and external architectural materials.</p> <p>Emerging from the research, a recent development addresses the recycling of Cathode Ray Tube (CRT) lead-bearing glass – currently designated by the Environment Agency as hazardous waste and presenting a major environmental problem to both the UK and the global recycling industry, due to the issue of lead content contaminating groundwater. Testing by the Environment Agency National Testing Laboratory has verified that incorporation of CRT glass in the new material results in the lead content being safely encapsulated, offering a solution to the global problem of hazardous CRT waste glass recycling - allowing CRT glass to be re-classified as a safe raw material.</p>

Impact on Cultural Discourse

Since 2004, Binns' research has involved developing innovative processes for adapting ceramic bodies that have broadened the aesthetic vocabulary and technical boundaries of contemporary ceramics - resulting in invitations to participate in many international exhibitions, workshops and conferences (see section 4), including invited membership to the UNESCO International Academy of Ceramics (Geneva).

"Binns explores how clay can be altered and manipulated to evoke both imagined and manufactured archaeology, that makes reference to geological qualities of clay, while also creating an illusory history....intriguingly ambiguous, combining grandeur with a suggestion of function", Emmanuel Cooper (2000, p6).

Commenting on the significance of Bremner's research, Merek Cecula, curator of Object Factory: The Art of Industrial Ceramics, in his catalogue introduction, stated:

"Research continues on the potential to use ceramic materials for architecture and interior structures. David Binns and Alasdair Bremner from the University of Central Lancashire (UK) lead the field by challenging the traditional limitations of clay and investigating the creative and aesthetic possibilities of recycled ceramic waste".

3. References to the research (indicative maximum of six references)

- Binns, D., 2012a. A Methodology For Recycling Ceramic Waste – an investigation of the creative potential of re-cycled glass and ceramic waste. *NCECA conference book – Seattle, USA*
- Binns, D., 2011. 'WASTE & PLACE' – an investigation of the creative potential of re-cycled glass and ceramic waste. *Ceramic Arts & Design for a Sustainable Society - Conference Journal*. Gothenburg, Sweden Pgs 64-74 ISBN: 9789163381843
- Bremner, A. (2009) *Object Factory: The Art of Industrial Ceramics* (exhibition catalogues –Museum of Arts & Design, New York, USA) ISBN 1-890385-19-0 & Gardiner Museum, Toronto) ISBN 978-0-9784999-0-7 [Link to 'Object Factory' exhibition - Museum of Arts & design, New York](#)
- Bremner, A. (2009) 'Brick Project' European Ceramic Work Centre (EKWC) Exhibitions and Books, Dutch Design Week 2009. *Brick: The Book*. Edited by Rene Erven and Noor Zwinkels. ISBN: ISBN 978-90-70666-pp 24-8
- Binns,D., 2012b. 'A methodology for Recycling Ceramic waste – an investigation of the creative potential of re-cycled glass and ceramic waste'. In: Harrison,R., 2013. *Sustainable Practice in Ceramics*. London: A&C Black Publishing. ISBN 978-1408157589
- Binns,D., 2012c. 'The Aesthetic of Waste – collaborative research exploring the creative & commercial potential of kiln cast re-cycled mineral waste'. In: Kettle, A., 2013. *Collaboration Through Craft*. Bristol Classical Press. ISBN: 0857853910

4. Details of the impact (indicative maximum 750 words)

The impact of this research has been on two main groups of beneficiaries:

- the ceramic & glass industries;
- the sustainable building materials industry;

Ceramics and Glass industry (Impact on studio and industrial production)

Collaborative research developed by Binns and Bremner, bridging art practice, craft, design and industrial manufacturing, has had a significant impact in a number of ways on the creative, technical and sustainable development of silicate-based materials. Binns' research into adapting clay bodies has freed clay artists and designers from a reliance on traditional surface treatments such as glaze, expanding the repertoire of aesthetic approaches to the material. A number of key internationally published ceramics texts highlight the distinctiveness of these processes:

Impact case study (REF3b)

- Standon, K., 2013. *Additions to Clay Bodies*. A&C Black. ISBN: 9781408153949
- Taylor, L., 2011. *Ceramics - Tools and Techniques for the Contemporary Maker*. Jacqui Small LLP. ISBN-13: 978-1906417673
- Perryman, J., 2008. *Naked Clay*. A&C Black.
- Aggregates in Ceramic Bodies – a Research Project. *Ceramic Technical - International Ceramics Periodical (Australia)*, Issue No. 23, (2007), 57– 62. ISSN 1324 4175.
- Terre et Verre Fusionnés. *La Revue de la Céramique et du Verre*, Issue No. 152 (2007), 21 – 23. ISSN 0294-202 X.

Impact on the wider professional practitioner and academic audiences has also been achieved through Binns being invited to participate in a number of international conferences and symposia:

- Meeting the Masters programme, The International Ceramic Studio, Hungary (2008).
- SERES09 International Ceramics Conference, Anadolu University, Turkey (2009).
- International Ceramics Studio, Hungary (2011).
- Ceramic Art & Design for a Sustainable Society Conference, Gothenburg, Sweden 2011.
- Zibo, China (2011).
- Wanju City, S. Korea (2013).
- Invited guest speaker at the 2013 Gyeonggi International Ceramic Biennale, S.Korea.

Binns research, examining how recycled ceramic materials may be integrated into ceramic production, was presented at the NCECA conference in Seattle, USA and is featured in a new book: Harrison, R., 2013. *Sustainable Practice in Ceramics*. London: A&C Black. The process is being adopted increasingly within both studio and industrial environments and is having a significant impact in promoting sustainable practice.

Sustainable building materials industry (Impact on Environment)

Following receipt of an AHRC Large Research Grant 2008–2011 (£163,454) *'The Aesthetic of Waste' - an investigation of the creative & commercial potential of kiln cast re-cycled mineral waste (Grant Reference: AH/E009492/1)*, the researchers developed a unique material, made from recycled glass, ceramic and mineral waste, offering applications within a variety of architectural contexts. Binns & Bremner's collaborative development of this new material, which offers innovative solutions to architectural products, has a number of sustainable characteristics, which sets it apart from other architectural materials:

- It is made from 97–100% recycled waste;
- It avoids any cementateous or synthetic polymers, common to many current 'green' composite products;
- It requires a lower firing duration and lower temperatures than conventional ceramic production, which lowers carbon emissions;
- All manufacturing waste (trimmings, sludges) can be re-introduced into the raw material input stream (Zero Waste, Closed Loop Manufacturing);
- It can be recycled at end of life and re-introduced into the raw material input steam (Cradle to Cradle Design Paradigm, End of Life Manufacturing).

The project offers a number of significant environmental impacts:

- The material provides architects and designers with a sustainable alternative to products such as clay tiles and stone cladding; products derived from non-replenishable virgin materials.
- It diverts low value waste streams from landfill into the production of a high-value product.
- The process utilizes locally sourced waste (avoiding excessive transportation of raw materials).

Impacts have been delivered through knowledge exchange with an international design audience,

Impact case study (REF3b)

and through participation in a number design projects:

'Ceramics & Architecture', Dutch Design Week, Eindhoven 2009.

Object Factory: The Art of Industrial Ceramics, Gardiner Museum, Toronto & Museum of Arts & Design, New York, USA. 2009.

Prototypes of the new material, exhibited at 100% Design, London, 2010, generated considerable interest from Architects and Designers (including ARUP, Foster & Partners and White Design).

The utilization of waste, lead-bearing CRT glass, offers significant additional environmental impacts. The recycling and disposal of CRT glass is a pressing global environmental problem due to the lead content, prohibiting its use in most established recycled-glass applications. Globally, it is estimated that at least 1.9 billion screens are still in use. The process of safely encapsulating lead-bearing CRT glass in their new material, developed by Binns & Bremner, offers a real solution to the global problem of hazardous CRT glass recycling. Testing has also verified that the CRT glass bearing material can be either recycled or if necessary, safely land-filled at end of life. A spin-out company is currently being established, to exploit these new technologies and a patent has been filed to protect the IP (International Patent Application No PCT/GB2013/052820 Claiming priority from GB 1219511.1)

5. Sources to corroborate the impact (indicative maximum of 10 references)

CONTACT 1: Alexis Harrison, Senior Designer (Materials), ARUP, London.

CONTACT 2: Tim Forster, WHITE DESIGN Architects, Bristol.

CONTACT 3: Paul Finnerty, Legal Director, Recycling Lives Ltd.

CONTACT 4: Mike Brennand, Regional Director NW, Frontier IP Group Plc.

CONTACT 5: Steve Mattison, International Co-ordinator, International Ceramics Studio (Kecskemet, Hungary).