UNIVERSITY OF LIMERICK
OLLSCOIL LUIMNIGH

Technology Transfer Office

Licensing Opportunity

# 3D printing radio-opaque multi-material components

## Overview

The 3D printing market is expected to reach USD 30 Billion by 2022, at a CAGR of 28.5% between 2016 and 2022. The innovations in this market are in materials and printing technologies. Medical applications are one of the highest growth sectors for 3D printing.

The most common 3D printing materials are polymer based. Polymer is radiolucent, meaning it is not easily detectable by x-ray imaging. X-ray imaging is a non-invasive technique and is based on the principle that heavier atoms are more likely to attenuate radiation. Since everyday polymers are made up of light atoms, there is no X-ray attenuation. A key limitation of 3D printing for medical use is that polymers are naturally radiolucent.

The advantages of 3D printing are well described, and the development of a radiopaque material suitable for multi-material printing has potential applications across multiple disciplines.

## Technology

Radiopaque 3D printing material is a step towards being able to manufacture complete medical devices using 3D printers. Researchers at the University of Limerick have developed a radio-opaque material for multi-material 3D printing that replicates the appearance of bone under X-ray imaging modalities. The materials/inks developed in UL are based on nanoparticles which are considered safe with medical grade.

## Benefits

3D Printing of anatomical models is well described, however, the use of these models for teaching or training in the radiological setting is limited due to the similar densities of current multi-material printing materials.

Our newly developed material has an equivalent radiodensity to that of compact bone and can be diluted with a second or subsequent material to produce varying radiodensities.

The radiopaque material is:

- UV curable that meets the technical requirements for poly jet printing (particle size suitable to passing through a 50 µm aperture on a piezo printing head). UL researchers have demonstrated the radiopacity of samples relative to the porcine bone under standard plain film X-ray.
- Commercially available medical grade inks targeting applications based on radiopaque properties.

## Applications

Medical Device Application

1. Fabrication of components with integrated, radiopaque positioning markers. This may be of particular benefit in delivery systems for prosthetic heart valves, pacemakers, filters, coils, or occlusion devices.
2. Scanning a particular body part. Or positioning for x-rays of body parts.
3. Surgery Planning and training, CT technician training.
4. Other potential applications include shielding and positioning in oncology.
5. Targeting applications based on radiopaque properties.

UNIVERSITY OF LIMERICK OLLSCOIL LUIMNIGH | Technology Transfer Office

# Licensing Opportunity

## Commercial Opportunity

The University of Limerick is seeking partners to exploit the commercial potential of these technologies by entering into licensing agreements and research collaborations.

Potential partners could include composite material manufacturers, manufacturers of 3D-printed products, and additive manufacturing.

☒Development partner

☐Commercial partner

☒Licensing

☐University spin-out

☐Seeking investment

**Further IP information**

1. Patent Title: Additive Manufacturing Material

   Type: PCT; Regional

   Country: EPO

   Status: Filed

   Priority: 04-Sep-2017

   Application number: PCT/EP2018/073748 (PCT); EP18772743.3 (Regional)

2. Patent Title: Formulation for 3D printing and a 3D printed article

   Type: Provisional (UK); Regional (USA)

   Country: UK; USA

   Status: Filed

   Priority: 04-Sep-2017

   Application number: 1714169.8. (Provisional, UK); US 16/642205 (Regional, USA)

## Contact

Margaret Lawlor / Joan O'Sullivan

margaret.lawlor@ul.ie

joan.b.osullivan@ul.ie

## Figures

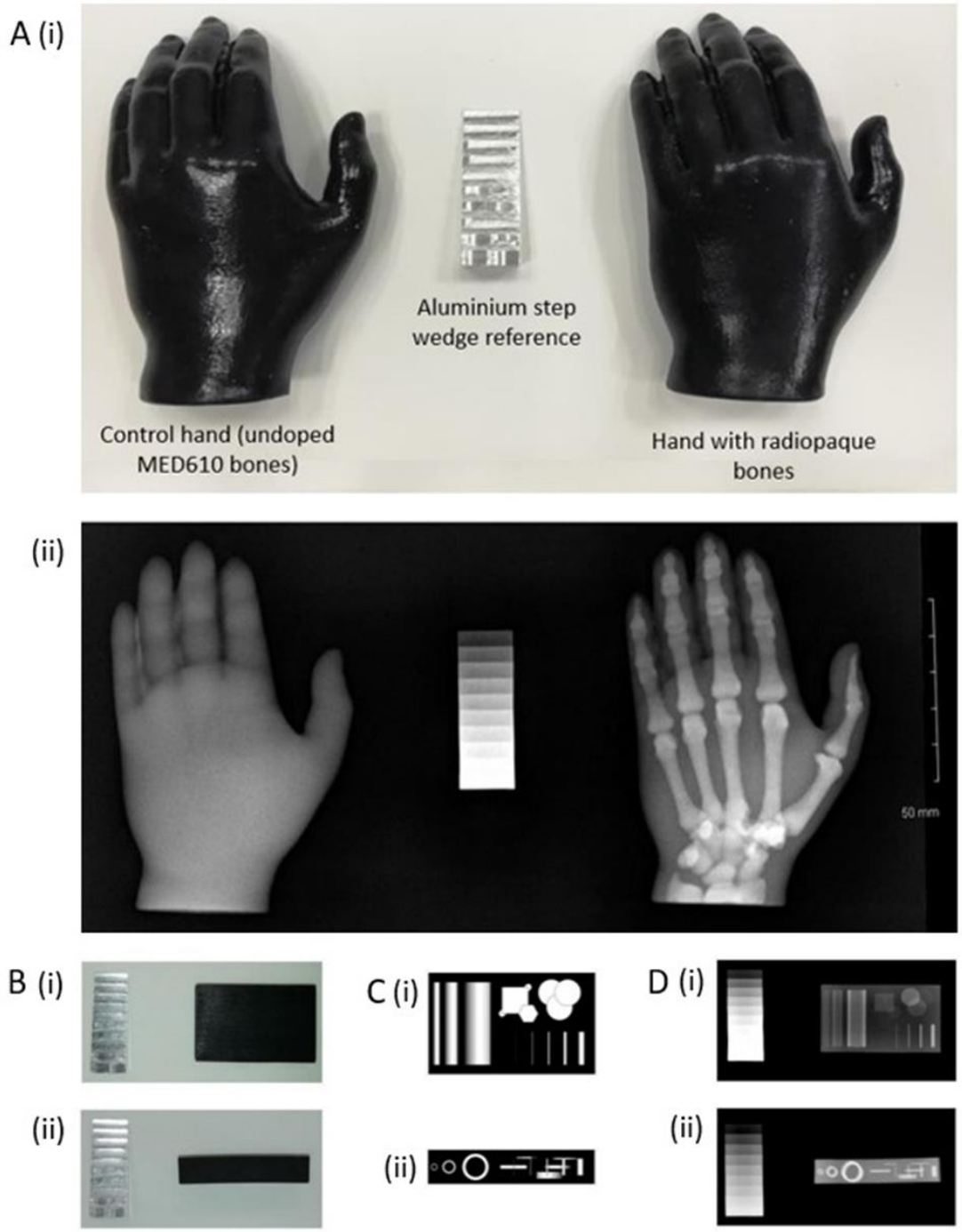


Figure 1. A 3-D printed anatomical object made from two polymeric materials in which one of the materials comprises ceramic particles to make that specific material radio-opaque to mimic an anatomical situation (like a bone, or calcification ion a vessel). 1 Left – Hand with bones printed using standard 3D printing resin and the right printed with radiopaque ink. (i) the Top images are a photograph of the test models, and (ii) the Bottom is of the corresponding X–ray.