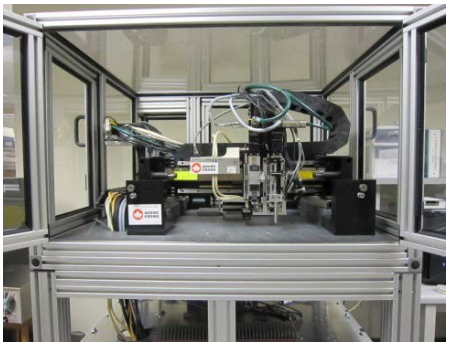
UNIVERSITY OF WATERLOO

TECHNOLOGY SUMMARY

3D Variable Density Printing



Newly developed additive manufacturing system

Reference

8810-7349

Inventor(s)

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Patent status

Issued US Patent and Pending in Canada; PCT application

Stage of development

Fully functioning prototype
Ongoing research collaboration with Mount Sinai Hospital of Toronto

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Background

By varying the density of a 3D part, many valuable and unique components may be made for a plethora of applications. Building lighter weight components for an automobile or airplane helps reduce their weight and hence increase their fuel efficiency. Complicated catalytic systems may be printed in one piece, with various materials and various densities (porosities) to enable more efficient chemical reactions. Piezoelectric sensors and actuators for which varying density is crucial may be made in one piece resulting in greater and more accurate sensitivity. Replacement biodegradable implants with different porosities at the bone interface end and tendon interface end may be created, which will promote improved healing.

Description of the invention

Researchers at the University of Waterloo have developed a novel additive manufacturing technology to realize the fabrication of complex-shaped parts created using a variety of materials (including metals and ceramics). The porosity of these parts may be varied throughout the entire structure.

Our invention allows us to integrate multiple materials during the fabrication process. The workstations includes several novel sub-systems that produce controlled feature sizes in the range of 100-500µm, allowing for interconnected networks of channels while avoiding loose powder material from being trapped inside larger-sized parts. Active control of process parameters is one of the other important features of the system.

Advantages

The unique features of this layered fabrication system have opened up new avenues for researchers in the fields of lighter weight parts, unique catalyst design, porous piezoelectric devices, and variable density bone replacement implants.

Potential applications

- Lighter weight parts for automotive and aerospace applications.
- Complex catalyst designs not previously possible.
- Porous piezoelectric sensors/actuators with improved accuracy and sensitivity.
- Variable density biodegradable bone implants for optimal soft and hard tissues regeneration.