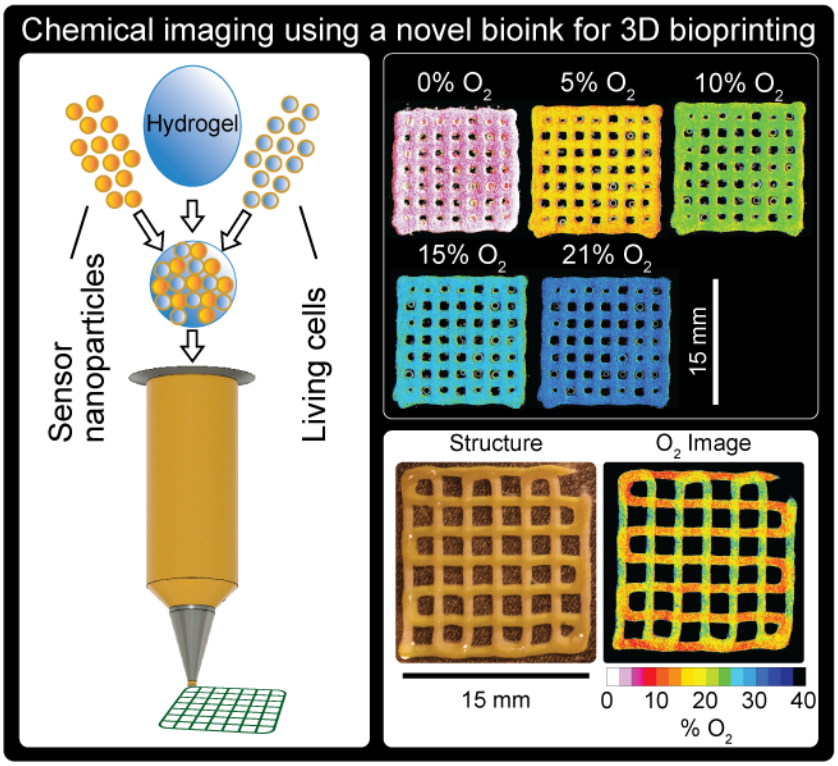
THE TECH TRANSFER OFFICE
UNIVERSITY OF COPENHAGEN

Functionalised bioinks

For non-invasive monitoring of cell metabolism, chemical gradients and microenvironments in 3D bioprinted living constructs



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Case number: 521-0554

Background

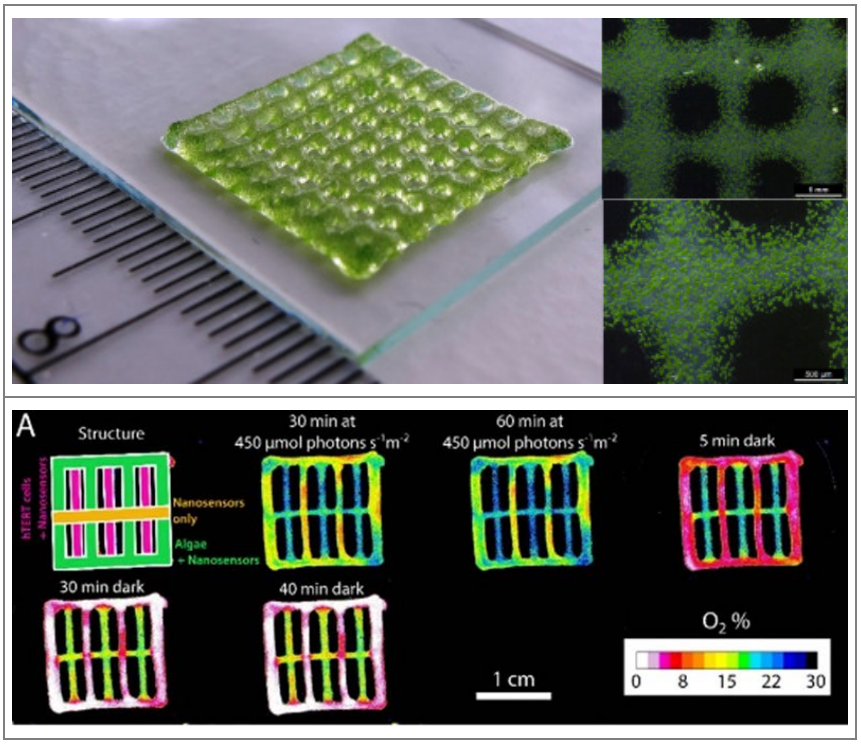
In complex 3D culture systems, such as bioprinted constructs with clinically relevant dimensions, the local oxygen (O_2) concentration is a key parameter regulating cellular growth and metabolism. The O_2 supply depends on diffusional exchange between the surrounding medium and the construct, where the macroporosity of the hydrogel scaffold and the permeability of the hydrogel material (the bioink) play important roles. Being able to monitor the local concentration of O_2 in bioprinted constructs is therefore interesting for the evaluation of cell growth and/or overall design parameters to optimize the O_2 supply.

The invention

The technology makes it possible to functionalise bioinks with sensor nanoparticles dispersed throughout 3D-printed constructs. This enables non-invasive monitoring in intact constructs of cell-to-cell interactions, metabolic activity and chemical microenvironments and dynamics.

The technology can provide detailed knowledge about nutrient or substrate availability and cell response to treatments with e.g. antibiotics, other drugs or growth-promoters

You can read more about the technology here.



3D printed structure containing green algae (top), and microalgae, stem cells and nanoparticles, enabling read-out of spatial O_2 distribution and dynamics (bottom).

Key selling points

- Non-invasive
- Compatible with commercial and custom-made bioinks, e.g. alginate- or GelMa-based bioinks
- Widely applicable – e.g. microalgae, bacteria and stem cells
- Online monitoring and 2D and 3D mapping of chemical gradients

Development status

We have proof-of concept with oxygen-sensitive nanoparticles, and the technology is likely to work with many other types of sensor nanoparticles (e.g. pH), alone or in combination. We seek a partner to explore the technology's applicability in different areas of research and its compatibility with common equipment.

Intellectual property rights

PCT application number: PCT/EP2019/059225