Developing biocomposite materials as low-carbon alternatives to ceramic tiles

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**Overview:** we have developed a low-energy, scalable process to produce bio-based alternatives to ceramic materials

- Innovative approach & proprietary platform technology
- Low-cost, sustainable and scalable process
- First use case: sustainable alternative to ceramic tiles

**Project aim:** to develop and optimise a core material – Cyalith
**Problem:** the European ceramic tiles sector is facing a crisis

- Unsustainable processes
- High energy prices
- Tightening emissions regulations

**Sustainable alternatives are needed for producers and customers**
**Solution:** a process that massively reduces carbon footprint

The **BioSintering®** process:

a drop-in solution for the hot problem faced by the ceramic sector
First use case: Cyalith

Cyalith tiles

Up to 94% lower CO₂ footprint

>95% recycled content

Working towards active standards (EN 14411)

This project: improve the flexural strength of Cyalith from 4 to >12 MPa
Step 1: Additive screening
Step 2: Optimisation though hybrid DoE

Augment human researchers with computational tools

Result: achieved Ultimate Flexural Strengths in excess of 25 MPa
### Competition case study: BioMason Inc.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Deakin Bio</th>
<th>BioMason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding</td>
<td>£0.3m</td>
<td>&gt;$96m</td>
</tr>
<tr>
<td>Development</td>
<td>~2 years, small team, basement</td>
<td>10+ years, large team, professional labs</td>
</tr>
<tr>
<td>Flexural strength</td>
<td>Up to 25 MPa</td>
<td>3.5 MPa</td>
</tr>
<tr>
<td>Production cost</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Sale price (m$^2$)</td>
<td>£40-150</td>
<td>£200</td>
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<tr>
<td>Production time</td>
<td>Fast</td>
<td>Slow</td>
</tr>
<tr>
<td>Scalability</td>
<td>Great</td>
<td>Poor</td>
</tr>
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**Deakin Bio**: better performance, scalability and cost than well-funded competitors
Our business model: low capex and exploiting existing industry assets

1. Technology licencing (royalties on sales):
   • Bespoke tile manufacturer, looking to convert existing product lines and address exclusive high end clients
   • Enables rapid demonstration of production on existing production lines
   • Discussions in progress

2. In-house manufacturing (direct revenue):
   • Initial small volume production runs.
   • Build market interest with high visibility clients, build product awareness through trade journals, etc.

3. Sub-contract manufacturing (direct revenue):
   • Use experience from licensee production to build confidence in volume production
   • Enables Deakin to supply larger clients and put agreements in place with national tile distributors

Trident approach: for flexibility & rapid growth
**Traction:** strong non-dilutive support and growing commercial interest

- £270k+ in grants and prizes secured
- Interest in >4000 sqm. (estd. £200k revenue)
- Advanced negotiations with first licensee
**Summary:** a highly scalable, cost-effective approach to massively reduce the carbon footprint of ceramic production

- Breakthrough technology with huge impact potential
- Innovative development platform for future use cases
- Strong team with proven experience

**Project summary:**
- Additive screening identified a range of promising additives
- Hybrid DoE optimisation increased KPI by >600%, exceeding target 12 MPa requirement (EN 14411)