



Science-led Materials Discovery



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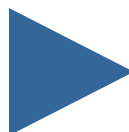
**Commercial issues and technology developments in sustainable
manufacturing, goods and services
September 22nd, 2011**





Overview

Rapid discovery of new materials for the energy, electronics and biomedical sectors



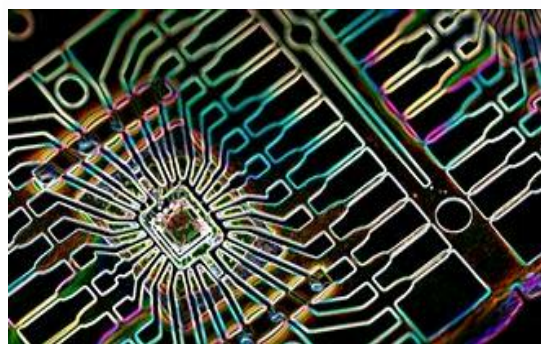
Early engagement of large multinational partners which co-fund the route to commercialisation



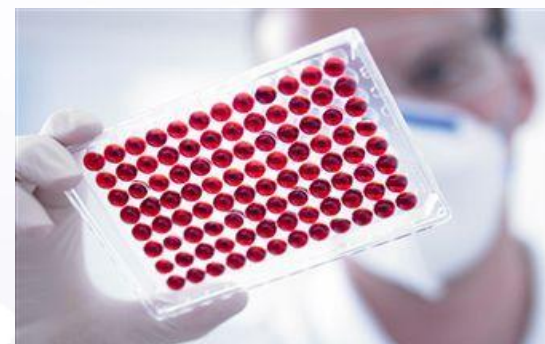
Revenue generating, low burn rate and clear upside potential through milestones and royalties on end product sales



Energy



Electronics



Biomedical



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Sustainability and Ilika



Chemistry Innovation KTN, Sustainable Chemistry Group

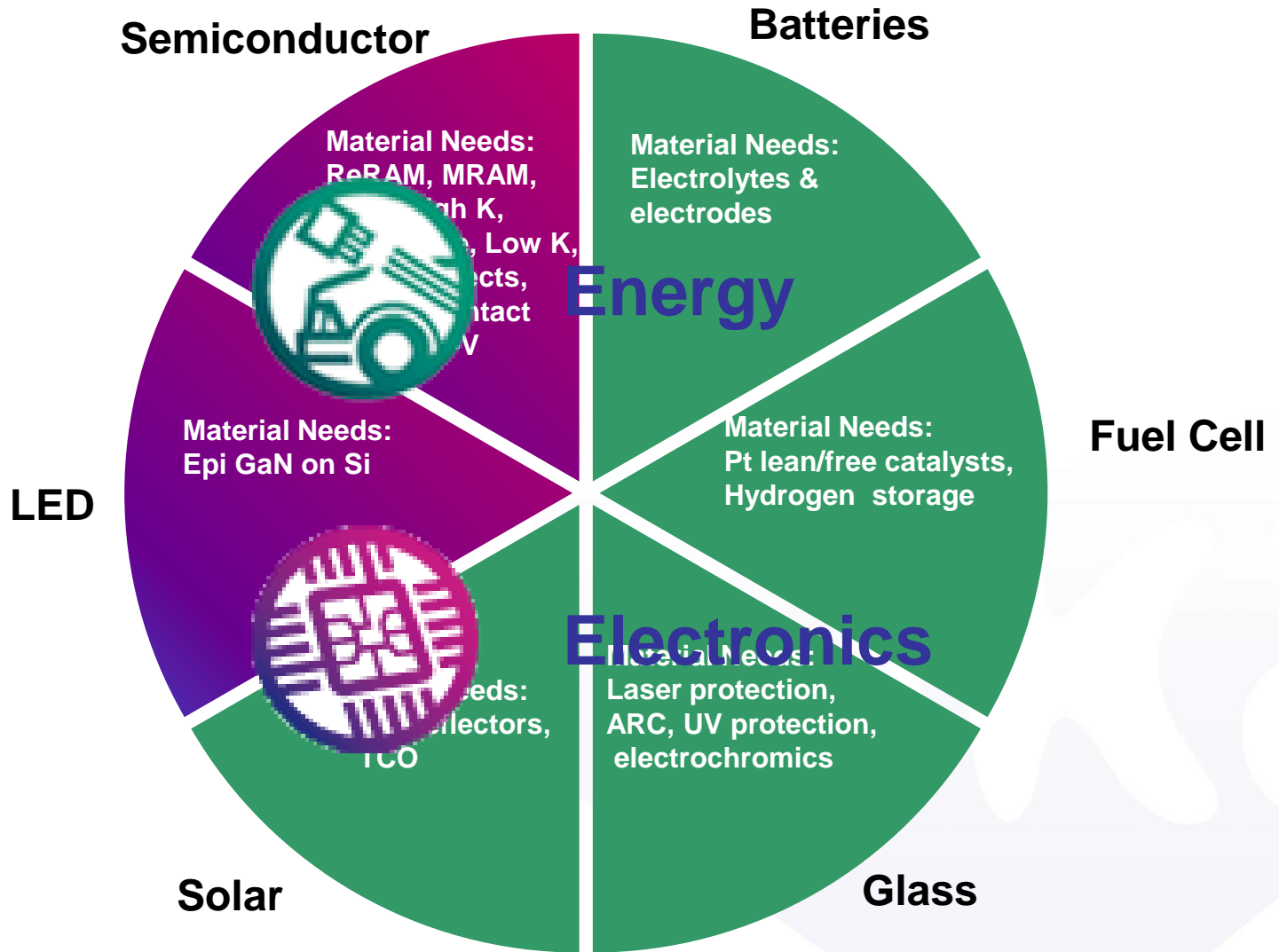
Definition of Sustainable Manufacturing in the Chemical Industries:

- Manufacturing routes for new or existing products with lower energy, lower material consumption and lower hazards.



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Ilika Target Sectors: Energy & Electronics



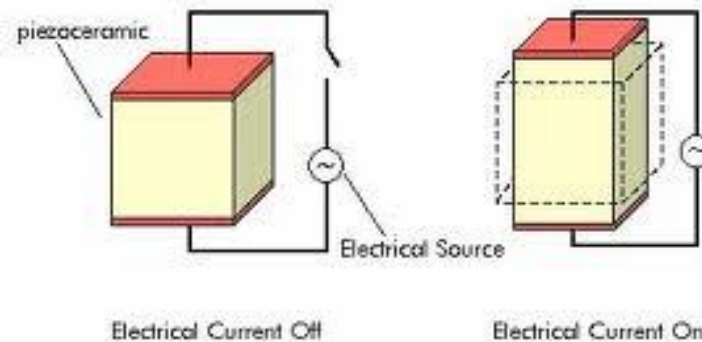
RoHS

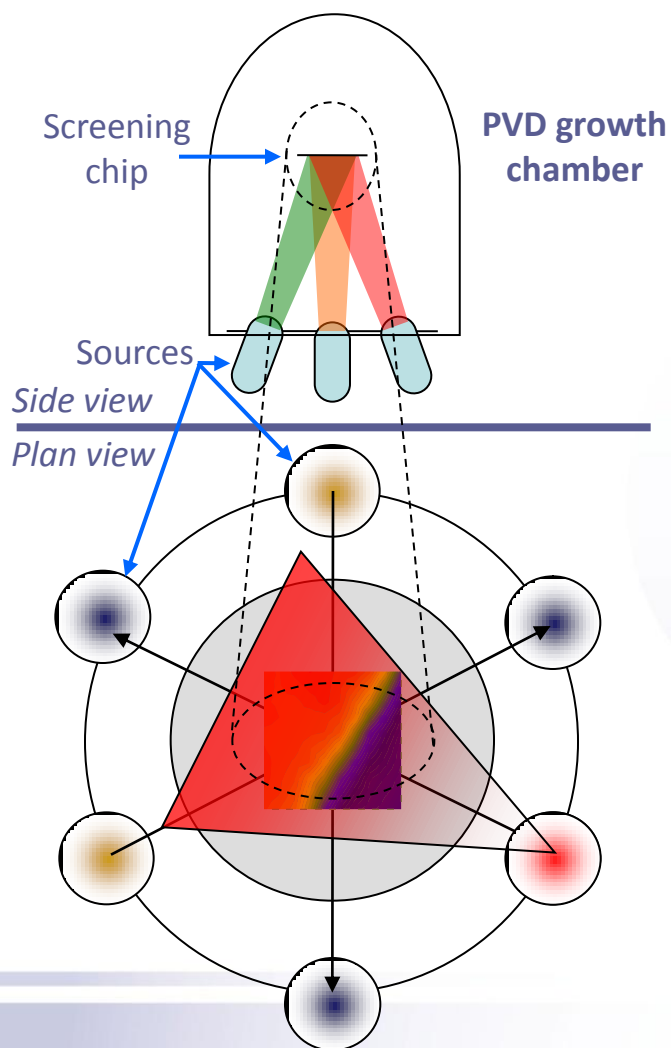


- RoHS stands for the “Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment”.
- The UK RoHS Regulations came into force on 1 July 2006.
- EU directive 2011/65/EU was published in July 2011, updating the previous regulations.
- One of the substances banned is lead.
- Some lead-containing materials are included in a list of exemptions, because alternatives are not currently available.
- One exempt material is lead zirconium titanate (PZT), used in piezoelectric devices.

Piezoelectric Devices

- **Piezoelectricity** is the charge which accumulates in certain solid materials in response to applied mechanical stress.
- Piezoelectric **devices** are sold into the automotive, aerospace, telecommunications and medical industries.
- **Applications** include sensor and actuator devices.
- The **global demand** for piezoelectric devices was valued at approximately US\$14.8 billion in 2010.

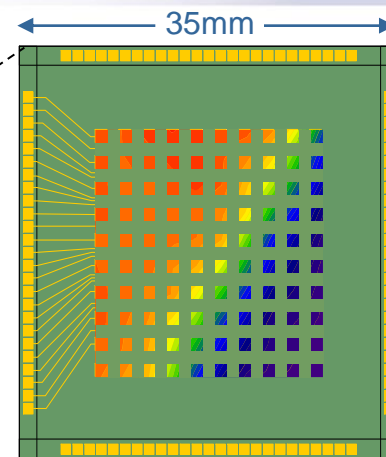




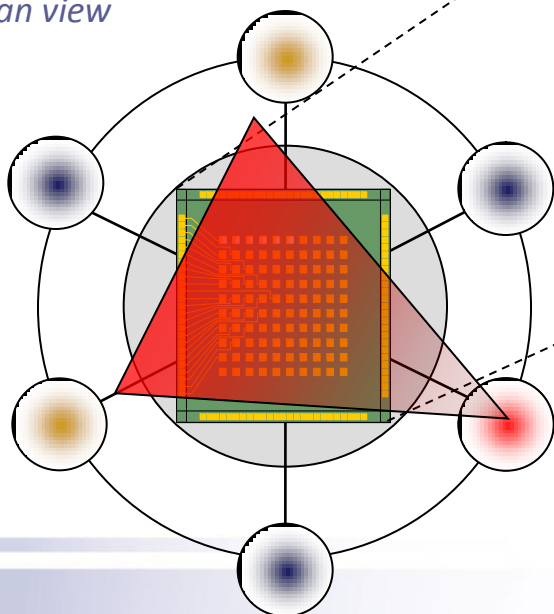
- Physical Vapour Deposition (PVD) – proven technology
- Unique high throughput design
- 6 x ultra high vacuum chambers
- Up to 6 different elements (sources) can be deposited to create an array of up to 100 different materials

- Simultaneous synthesis of multiple families of materials versus traditional step-wise approach
- Each 'field' on chip is addressable and can be analysed in a high throughput manner
- Control over composition

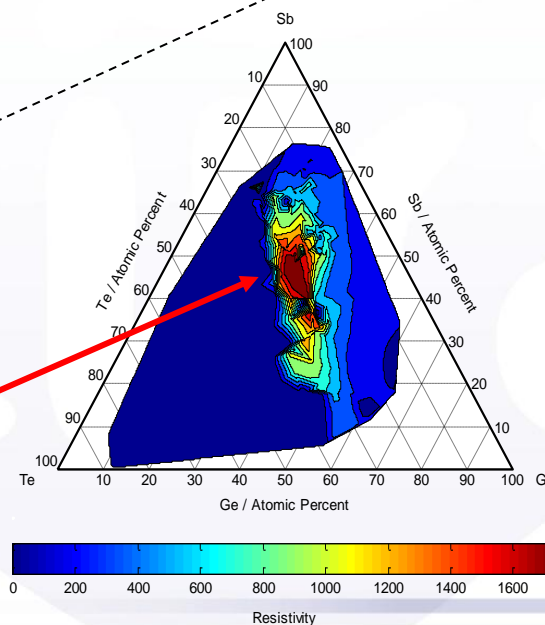
Addressable screening chip



Plan view



'Hot spot' identified of ceramic compositions of high piezoelectric response





Commercialization Partner

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- CeramTec, one of the world's leading manufacturers of technical ceramics
- Formerly part of Hoechst Group, now owned by Rockwood Holdings
- Ceramtec revenue: \$600 million p.a.
- \$150 million p.a. revenue for piezoelectric replacement

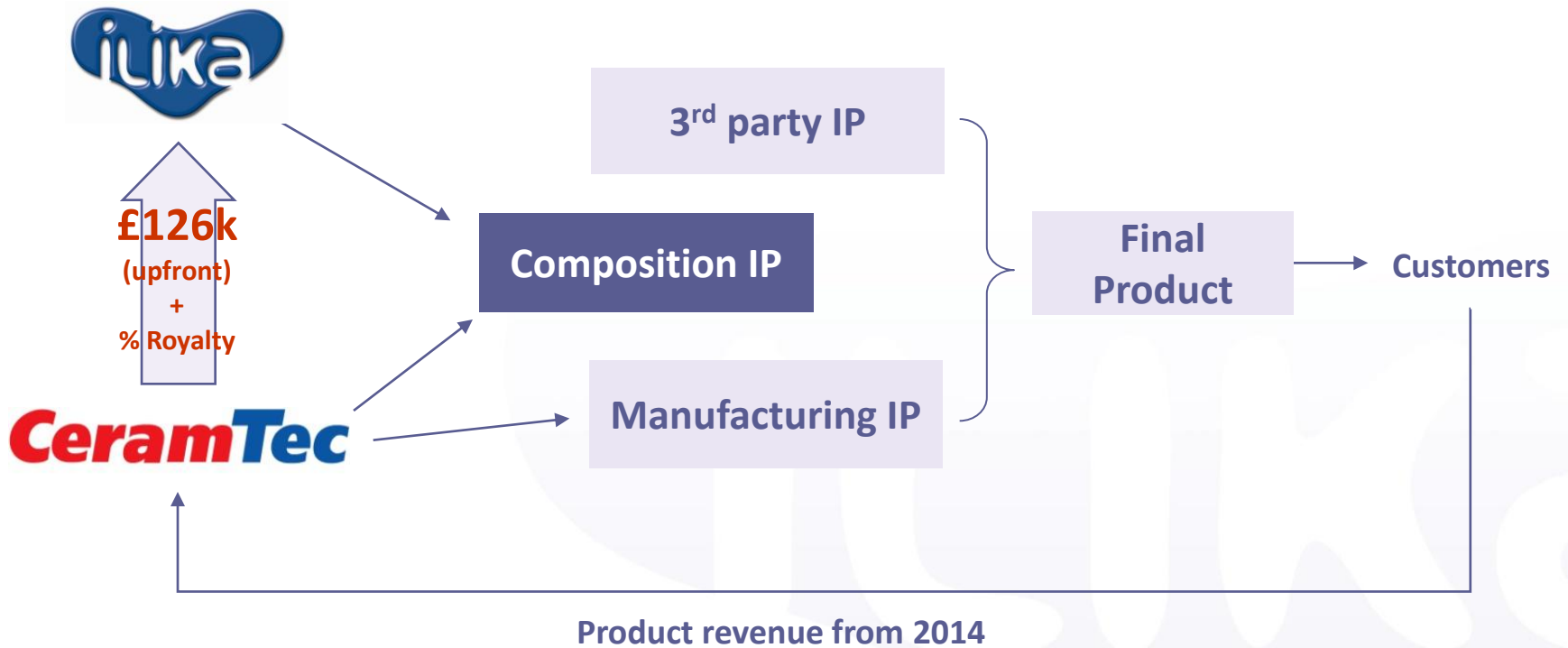
CeramTec





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Commercialization Deal





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Thank You!

