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High Quality Substrates for Boron Arsenide Semiconductor Devices

Beta cells are known semiconductor devices capable of direct conversion of nuclear energy into electric energy. Unlike common batteries or other chemical based energy sources, beta cells last a considerable amount of time, even decades, making them ideal for situations where long term power is needed.

Benefits:

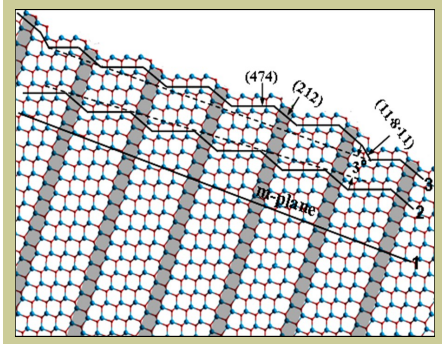
- Ideally Suited for Long term Battery Applications (i.e. pacemakers, satellites)
- Improved Self-Healing Substrates
- Low Defect, High Quality Epitaxial Layers
- Wide Band Gap Semiconductor Material

Drs. Michael Dudley, James Edgar and Martin Kuball, in collaboration with their research teams, have proposed the use of m-plane (1-100) 15R-SiC single crystals as substrates and have demonstrated better quality epitaxial layers by eliminating defects such as twins and translational variants.

The lower defect concentrations have resulted in improved optical and electronic properties making m-plane 15R-SiC single crystal substrates clearly the preferable material choice for IBA semiconductor applications.

Icosaheral Boron Arsenide (IBA) is a wide band gap semiconductor (3.47eV) with the extraordinary ability to 'self-heal' radiation damage, unlike previously developed silicon based beta cells. This self-healing property make IBA an extremely attractive choice for beta cell devices that are exposed to radiation. Up until now, wide spread use of this material has not been achieved due to lack of high quality substrate structures and compositions.

In the absence of native substrates, IBA has been heteroepitaxially grown on substrates with compatible structural parameters. This has been typically attempted on substrates with high symmetry that IBA but has resulted in structural variants, a phenomenon that is known to degenerate epitaxy. These variants have a detrimental effect upon performance and have severely hin-



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Applications:

- IBA Semiconductors
- Radiation (Neutron) Detectors
- Thermoelectric Converters
- Nuclear to Energy Conversion
- 3C-SiC Transistors and Diodes

Patents / Publications:

- PCT US09/47373

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