COMMERCIAL IMPACT

# Powering the Future: Transforming Bio-Waste into Next-Generation Battery Materials

## Pioneering sustainable anode technologies for the global sodium-ion battery market

**Rising costs, safety issues, and supply risks with lithium-ion batteries are driving demand for cleaner alternatives. Sodium-ion batteries (SIBs) offer thermal stability, abundant raw materials, and potential for EVs and grid storage—fueling a market projected to reach US$11.6 billion by 2033.**

At the forefront of this shift is Professor Deepak Dubal from QUT's Centre for Agriculture and the Bioeconomy, whose research focuses on creating high-performance hard carbon anodes using agricultural bio-waste. In collaboration with Sparc Technologies, Dubal's team developed a novel, low-cost and energy-efficient process to convert waste biomass into advanced battery-grade materials. Laboratory testing showed a 63% increase in reversible capacity over commercial equivalents, with consistent performance across multiple feedstocks.

With strong commercial interest and new funding secured, the research is now advancing to pilot-scale production. Preparations are underway to produce hard carbon materials at the kilo-scale, and a partnership with Xcel Sodium is set to further validate the technology using macadamia nutshell waste—supporting both clean energy innovation and regional circular economy outcomes.



This work positions QUT as a leader in sustainable energy materials research and contributes directly to Australia's ambitions for clean energy transition and sovereign battery capability.

### Impact highlights

- Developed an energy-efficient process to convert bio-waste into high-capacity hard carbon anode materials for sodium-ion batteries.
- Laboratory testing showed a 63% improvement in reversible capacity over existing commercial materials.
- Advanced to pilot-scale production with plans for kilo-scale output and commercial validation.
- Research led by Professor Deepak Dubal at QUT's Centre for Agriculture and the Bioeconomy.

QUT Centre for Agriculture and the Bioeconomy

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