Precursor Cathode Active Materials Pilot Processing and Opportunities

Jackson, M.1, Ghaebipanah, N.2, Chapman, N.3, Barnard, K.R.4, Holanda Pereira de Souza, D.5, Eksteen, J.6, Tang, T.7, and Polenio, A.8.

1.Senior Research Engineer, CSIRO Minerals Resources, Perth WA 6152. M.jackson@csiro.au

2. Experimental Scientist, CSIRO Minerals Resources, Perth WA 6152. Neda.ghaebipanah@csiro.au

3.Experimental Scientist, CSIRO Minerals Resources, Perth WA 6152. [Nicole.chapman@csiro.au](mailto:Nicole.chapman@csiro.au)

4. Group Leader, CSIRO Minerals Resources, Perth WA 6152. [Keith.barnard@csiro.au](mailto:Keith.barnard@csiro.au)

5. Research Project Officer, CSIRO Minerals Resources, Perth WA 6152. Diego.holandapereiradesouza@csiro.au

6. Professor, Curtin University, Perth WA 6102. Jacques.Eksteen@curtin.edu.au

7. Professor of Practice, Curtin University, Perth WA 6102. Tony.tang@curtin.edu.au

8. Technical Specialist, Curtin University, Perth WA 6102. Aissa.polenio@curtin.edu.au

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# ABSTRACT

The Future Battery Industries Collaborative Research Centre (FBI-CRC) in conjunction with Curtin University, CSIRO Mineral Resources and 18 industry and government partners set up Australia’s first nickel, cobalt, and manganese (NCM) precursor Cathode Active Materials (pCAM) pilot facility in Western Australia. It became operational in 2022.

The highly automated pCAM pilot plant consists of four parallel production units which can be operated separately, at various scales in either batch or continuous mode to a high level of precision and accuracy. It is possible to monitor the production units around the clock and alter the reaction parameters remotely. Coupled with the highly skilled operational team, comprising of Curtin and CSIRO staff, the pilot facility provides unparalleled capability for high throughput experimentation and simulation of commercial operations to help derisk and expedite future full-scale implementation for pCAM production.

Critical chemical and physical properties were determined in CSIRO’s on-site analytical facilities, providing results for timely decision-making and rapid prototyping. These analyses can test for chemical composition/purity (Inductively Coupled Plasma Mass Spectrometry (ICP-MS) and Optical Emission Spectrometry (ICP-OES)), crystallite and particle morphology (Scanning Electron Microscopy (SEM) coupled with energy dispersive spectroscopy (EDS)), Particle Size Distribution (PSD), Tap-density, crystal structure (X-ray powder diffraction (XRD)) and surface area and porosity analysis (BET).

The National Battery Testing Centre, hosted by Queensland University of Technology (QUT), calcinated and lithiated the pCAM product and incorporated the now Cathode Active Material (CAM) into batteries for electrochemical testing. Over the past two years of operation, the pCAM pilot plant has successfully produced a number of (standard) NCM precursor products which have been shown to meet and exceed the electro-chemical performance of commercial benchmark products.