

ECT Successfully Produces MXene Using Flash Joule Heating

Highlights:

- ECT's acquisition target, Xenica, has successfully produced MXene in the first runs of its scale-up optimisation program using its Flash Joule Heating (FJH) process.
- The MXene was produced under the R&D and Engineering Agreement with Metallium Ltd (ASX:MTM).
- Two separate flashes have now been completed in a structured program designed to identify optimal process conditions for repeatable production of MXene to commercial specifications, with an initial focus on defence applications.

Environmental Clean Technologies Limited (ASX: **ECT**) ("**ECT**" or "**Company**") is pleased to announce that Xenica Inc (a wholly owned subsidiary of its acquisition target Xenica Pty Ltd ("**Xenica**")) has successfully produced MXene in the first runs of its scale-up optimisation program using Metallium's Flash Joule Heating (FJH) reactor platform (refer to ECT's ASX announcement on 19 August 2026).

The reaction products were internally characterised by X-ray fluorescence (XRF) and scanning electron microscopy (SEM). Independent laboratory Moore Analytical performed X-ray diffraction (XRD) analysis of the reaction products, which showed changes in interlayer spacing consistent with the formation of chlorine-terminated MXene.

The MXene was produced under the existing R&D and Engineering Agreement with Metallium Ltd (refer to ECT's ASX announcement on 4 August 2026). The first flashes were completed in line with the timetable previously announced by the Company. The collaboration with Metallium supports ECT's ability to progress the structured flash program toward repeatable production.

Two separate flashes have now been completed in a structured program designed to identify optimal process conditions for repeatable production of MXene to commercial specifications, with an initial focus on defence applications.

These first flashes are a major step in refining the use of FJH to produce MXenes. ECT is now progressing through a structured optimisation program to target defence-relevant specifications, given the significant market potential in this sector and the Company's sublicence to produce and sell MXenes for defence applications.

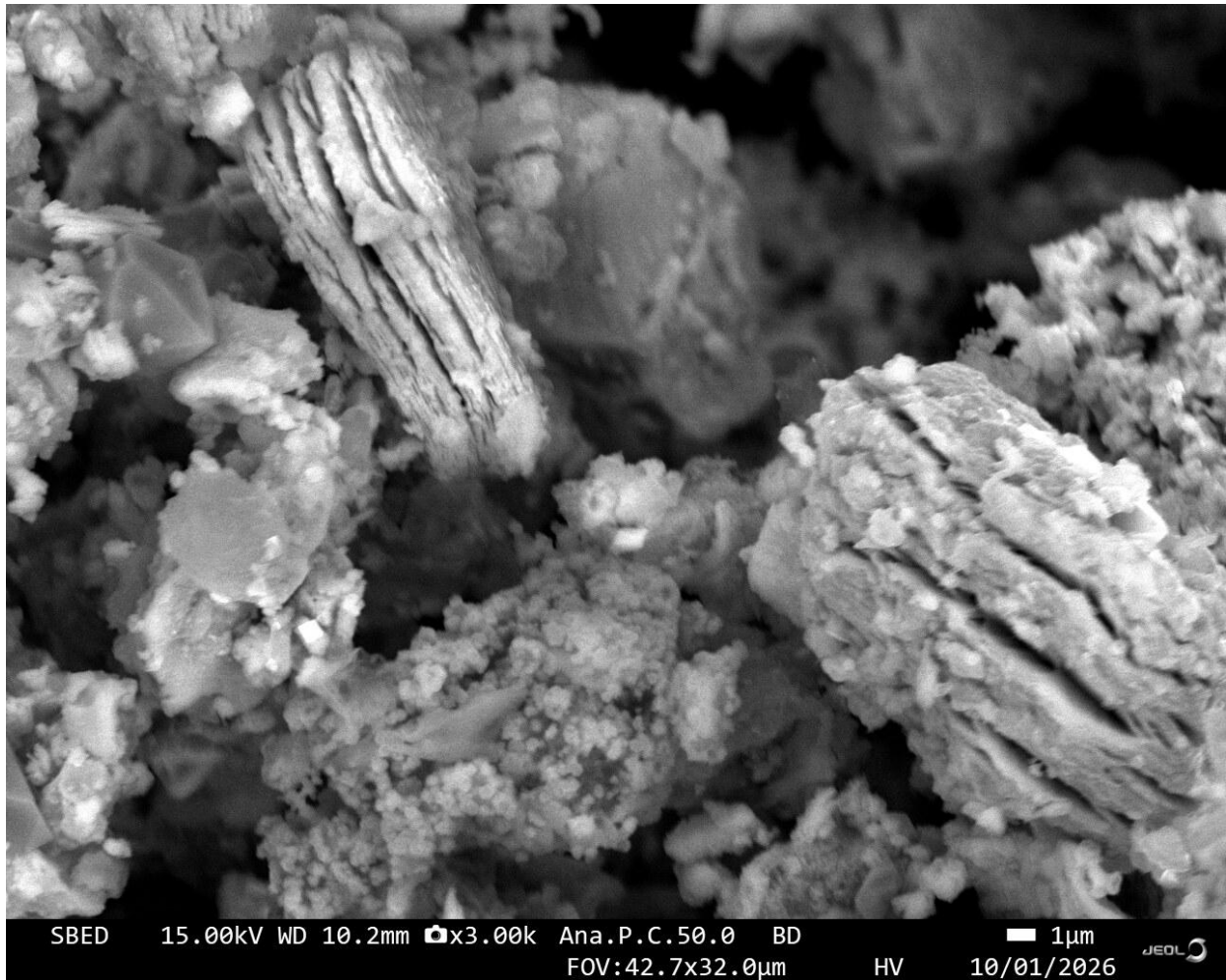


Figure 1: Scanning electron microscope (SEM) image of the bulk reaction product from the second flash, showing the open, layered structure expected of an etched MAX phase grain. Image captured at the Rice University Shared Equipment Authority.

Commenting on the update, Chief Scientist and CTO, Justin Sharp, said: “Successfully producing MXenes in the first flash runs marks a major milestone for ECT and provides strong support for our proposed acquisition. Our focus with MTM is now on improving conversion and product consistency, and on characterising the material against defence-relevant specifications. This work is an important step towards establishing a pathway to repeatable production and customer qualification.”

ECT Executive Chairman, Faldi Ismail, said: “These initial results are a highly encouraging step towards establishing a scalable, cost-effective U.S. source of MXenes for defence applications. Our focus is on turning this technical progress into a commercial opportunity by producing material consistently to target customer specifications. The next phase will combine process optimisation with identifying priority applications and preparing for customer evaluation.”

Metallium Managing Director and CEO, Michael Walshe, said: “This program highlights the commercial potential of Metallium’s FJH platform beyond metals recovery. Our collaboration with ECT provides an opportunity to generate additional revenue from our technology, engineering capability and U.S. infrastructure while supporting the development of advanced materials. We are now focused on improving process repeatability and generating the operating data needed to support further scale-up.”

Commercial Relevance

MXenes are an emerging class of two-dimensional (2D) materials that combine high electrical conductivity, low weight and highly tuneable surface chemistry. This combination makes MXenes one of the most promising materials for electromagnetic interference (EMI) shielding and advanced defence coatings, where thin, lightweight layers are needed to block, absorb or manage electromagnetic signals.

Potential defence applications include EMI shielding for electronics and communications systems, radar-absorbing and signature-management coatings, and protective coatings for sensitive equipment. These are performance-critical uses where materials are selected on capability rather than price, and where high-quality, Western-produced MXene is not currently available at scale.

Despite strong interest, adoption of MXenes has been held back by the cost, safety and limited scalability of conventional production methods.

FJH Advantage

ECT believes the real opportunity lies not simply in producing MXene, but in developing a scalable, cost-effective process to produce it. Conventional MXene manufacture selectively removes aluminium from a layered ceramic precursor (MAX phase) using hydrofluoric acid (HF) or similarly aggressive chemistry. These processes are typically limited to small batches (<100g), are time intensive and generate hazardous waste, making MXene prohibitively expensive for most commercial uses.

ECT's FJH process is fundamentally different. It is a dry, HF-free process with minimal waste. The first flashes processed batches of 400g of MAX phase precursor, with run times of 30 and 60 minutes. Published research in Nature Synthesis provides an early indication that FJH is faster, eliminates bulk acid handling, materially reduces waste and is potentially more scalable than conventional methods.

Through its collaboration with Metallium, ECT has access to an existing FJH reactor platform, engineering expertise and U.S.-based scale-up infrastructure. This allows the process to be evaluated beyond laboratory scale without ECT having to build its own specialised processing infrastructure. If successful, FJH could provide a lower-cost manufacturing pathway for MXenes and a key competitive advantage for ECT. The collaboration also supports Metallium's strategy to generate revenue by providing access to its reactor technology, engineering expertise and U.S. infrastructure.

Customer Pathway

ECT is initially targeting the defence market, with Xenica Inc holding a sublicense from MXene Inc. to produce, use or sell MXenes for military end-use (refer to ECT's ASX announcement on 14 September 2026). Defence is an attractive entry market because procurement is performance-led and demand for secure, Western-produced supply exceeds current availability.

To identify the highest-value opportunities for FJH-produced MXene, ECT intends to:

- map priority defence applications, beginning with EMI shielding and defence coatings, against the material specifications each requires;
- engage with prospective defence customers and programmes to understand performance requirements and qualification pathways;
- benchmark FJH-produced material against conventionally produced MXene; and
- deliver samples to prospective customers for evaluation as material meets target specifications.

This approach is consistent with research published in Renewable and Sustainable Energy Reviews, which proposed establishing early revenue in high-return military and medical applications and using that position to fund the manufacturing scale-up needed to unlock broader industrial markets.

Next Steps

The structured flash program will now continue. The next steps are:

- Further flashes across a range of process conditions, working towards repeatable production at Metallium's Gator Point facility in Texas, USA.
- Independent characterisation of the material against defence-relevant specifications.
- Delivery of samples to prospective defence customers.
- Customer and programme qualification.

This announcement is authorised for release to the ASX by the Board.

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