THE UNIVERSITY OF MELBOURNE

Opportunity

To accelerate the development of the microalgae fractionation method through licensing or direct investment, contact:

Shereen Tan
T: +61 3 8344 2538
E: tan.s@unimelb.edu.au

Microalgae fractionation method

Recovering high-value products using less energy

The technology

- The simple, energy-efficient and cost-effective fractionation method rapidly extracts lipids and proteins from microalgae without using toxic solvents.

Market need

- The high cost of commercial recovery methods limits their use to low-volume, high-value markets (eg nutraceuticals). To add value to existing markets or expand the value of microalgae to new markets such as food, feeds and fuels, more cost-effective extraction methods are required.

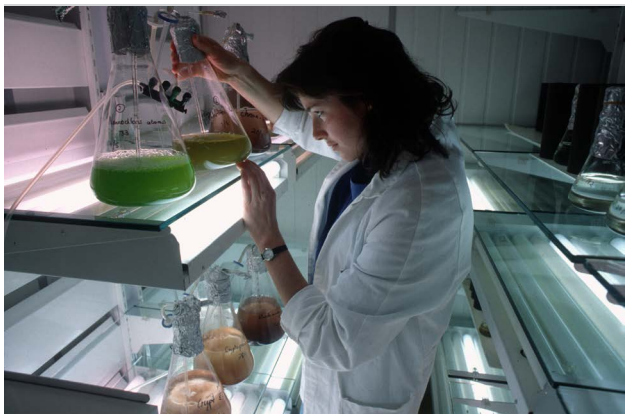
Technology status

- The microalgae fractionation method uses fewer steps and less energy to extract lipids and proteins with higher purity, separation efficiency and yields than existing methods.

Market need

Microalgae – single-celled, plant-like microorganisms that live in marine and freshwater environments – produce lipids and proteins that can be harnessed for commercial use. Microalgae grow rapidly year-round, fuelled by sunlight and carbon dioxide. They can be grown more productively than terrestrial crops, with no need for arable land or fresh water.

However, commercial methods for recovering useful components from microalgae are highly energy intensive, costly and not environmentally friendly. This limits the use of microalgal products to markets for low-volume, high-value goods such as food additives (valued at US$100 billion) and cosmetics and healthcare applications (valued at US$5 billion). To add value to existing markets or expand to new markets – including those for high-volume, low-value goods such as biofuels, chemicals, food and feeds (valued up to US$1000 billion), more cost-effective extraction solutions are required.



Picture: CSIRO Marine Research.

Solution

Current commercial recovery methods use thermal drying to remove excess liquid from the algal biomass. This consumes more energy than is in the biomass, and to resolve it must be submitted to cell disruption by mechanical methods, and hazardous chemicals must be added to extract lipids. It results in a highly stabilised oil-in-water emulsion which requires high-speed centrifugation to recover the lipid-rich solvent and proteins, while the hazardous solvent needs to be thermally evaporated for recycling.

The new method instead uses a phase-inversion process to produce a much less stable water-in-oil emulsion, which has lower viscosity and can be fractionated more easily using normal centrifugation processes. Less energy is needed to break the emulsion and separate the components, and no energy is required to evaporate the solvents for recycling.

By removing the need for toxic solvents that can degrade lipids and proteins, the new method also avoids damaging the final products.

Technology and IP status

Proof-of-concept studies using the industrially relevant marine algae *Nannochloropsis*, have revealed the method can operate at up to 25 per cent solids content, thereby minimising equipment costs, is more energy efficient and achieves more than 90 per cent separation efficiency.

The fractionation method is covered by a provisional patent application.

Tech name and number:	2018-083 Shear induced phase inversion of complex emulsions for phase separation
Researchers:	Associate Professor Greg Martin, Professor Muthupandia Ashokkumar, Mr Wu Li
Patents:	Provisional Patent Application AU2019/902082
Keywords:	algal biomass, industrial separation, extration, fractionation

THE UNIVERSITY OF MELBOURNE