Ionic Industries Ltd

Graphene is the newest wonder material, the first 2D material and by far the most conductive material known to humans.

Ionic has a portfolio of technologies leveraging graphene's conductive properties for energy storage and sensing applications.

Leveraging the properties of graphene, Ionic Industries has market-ready technologies for applications in global markets **predicted to be over $149B by 2028.**

Australian deep tech company with **graphene nanotechnology** in global fields of energy storage and data acquisition for the internet of things (IoT) and Industry 4.0.

Portfolio of technologies including **27 patents** and years of know-how focusing on the **conductive properties of graphene.**

World leading team combined with key university relationships to ensure long term technology leadership

Currently manufacturing tonnage quantities of graphene material with first revenues in sensing geotextiles expected in Q1 2023.

Ongoing research at it's newly-established commercial laboratory facility, continuing the work that has been underway with Monash University since 2011.

Energy Storage Technologies

Supercapacitor (EDLC)

- Pure carbon
- Infinite cycle life (>1000K)
- Long shelf life (decades)
- High power (>30 kW/L)
- Low Energy (5 Wh/L)

Hybrids

- Carbon + metal oxides
- Limited cycle life (50K)
- Medium shelf life (years)
- Medium power (5-10 kW/L)
- Medium Energy (20-100 Wh/L)

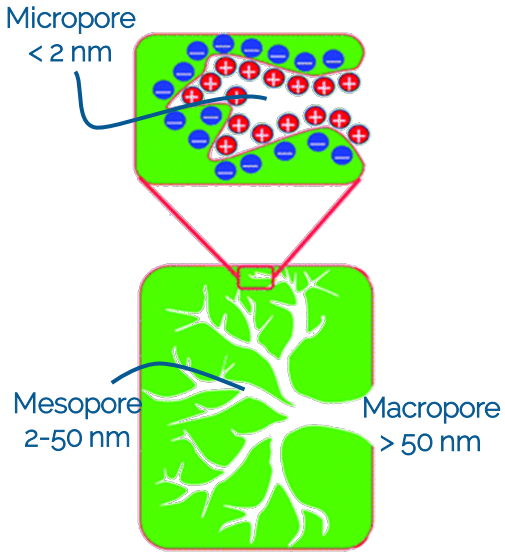
Batteries

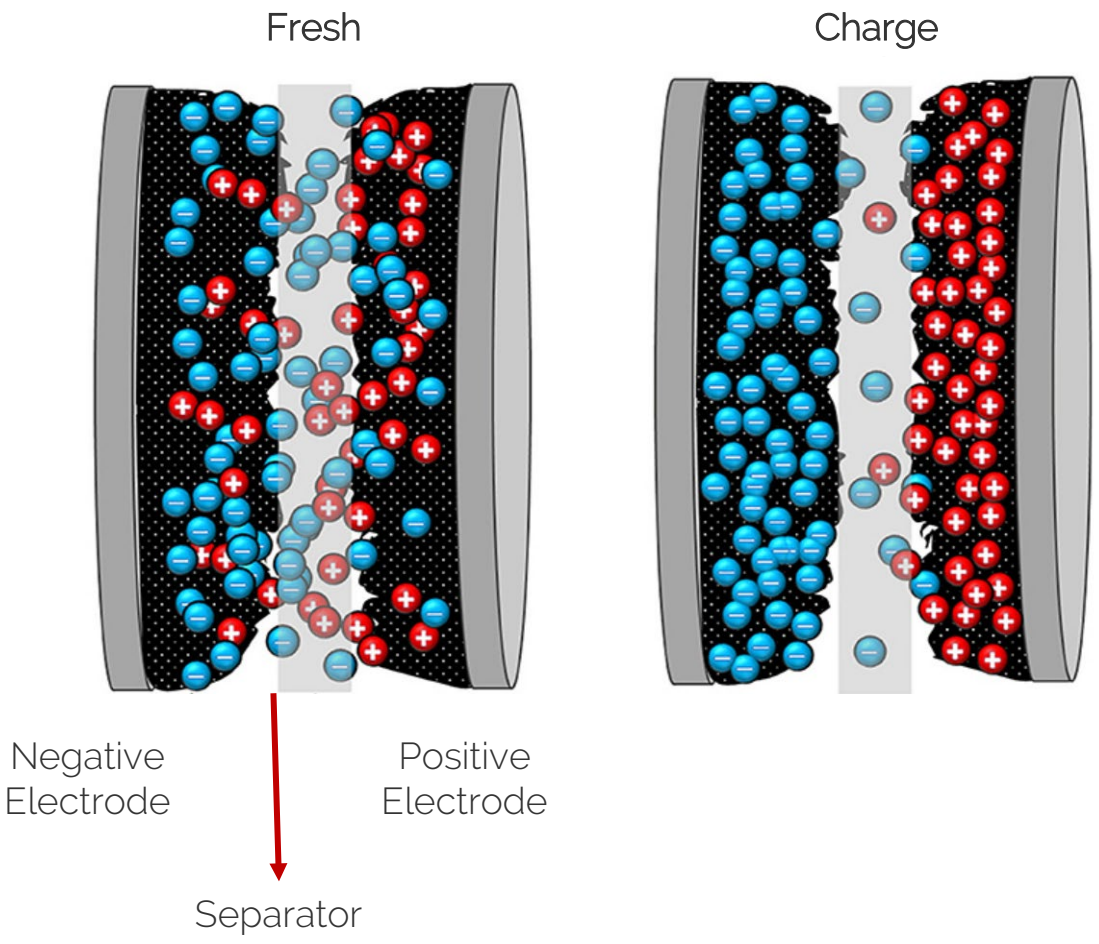
- Metal oxides / graphite
- Short cycle life (2-5K)
- Medium shelf life (years)
- Low power (1-5 kW/L)
- High Energy (300 Wh/L)

- Supercapacitors (EDLC) are high power (but low energy), carbon electrode cells with near infinite life.
- Hybrids are technologies that range from pseudo-capacitors (metal oxide doped carbon) through lithium-ion capacitors (LIC) to re-engineered batteries (for high power and low energy).
- Batteries embrace a wide range of chemistries, but lithium-ion (Li-ion) is the state-of-the art.

- Graphene is an engineered carbon. It is now being used as an additive in batteries to improve efficiency and power. There is no such thing as a "graphene battery".
- Until now, graphene EDLCs have not had the required energy density for commercial applications.

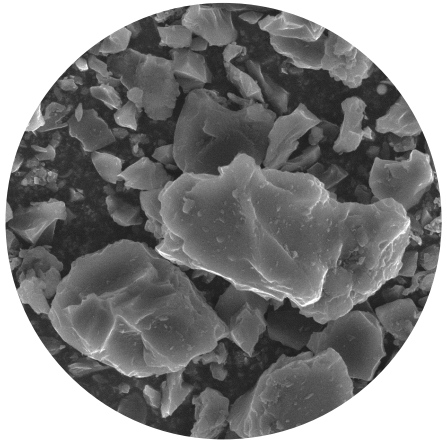
EDLC

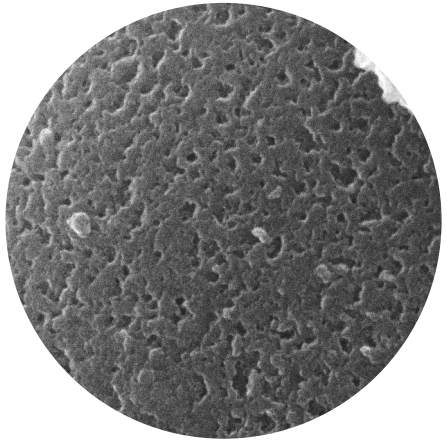




- Symmetric electrodes.
- Porous carbons as active material.
- Micro-, meso-, and macro pores.
- Electrostatic adsorption-desorption of ions in micropores.
- Low energy, high power.

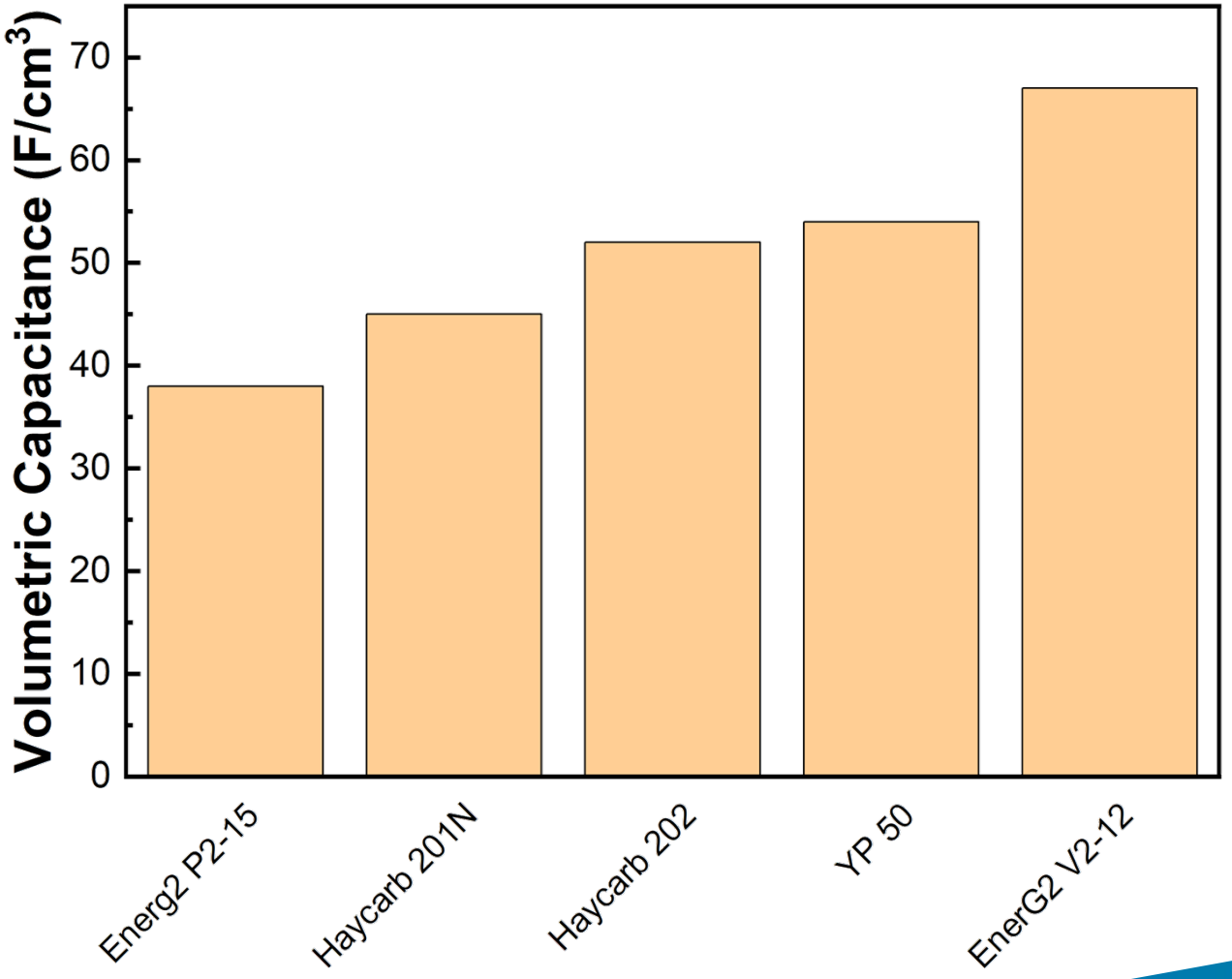
Current State of the Art



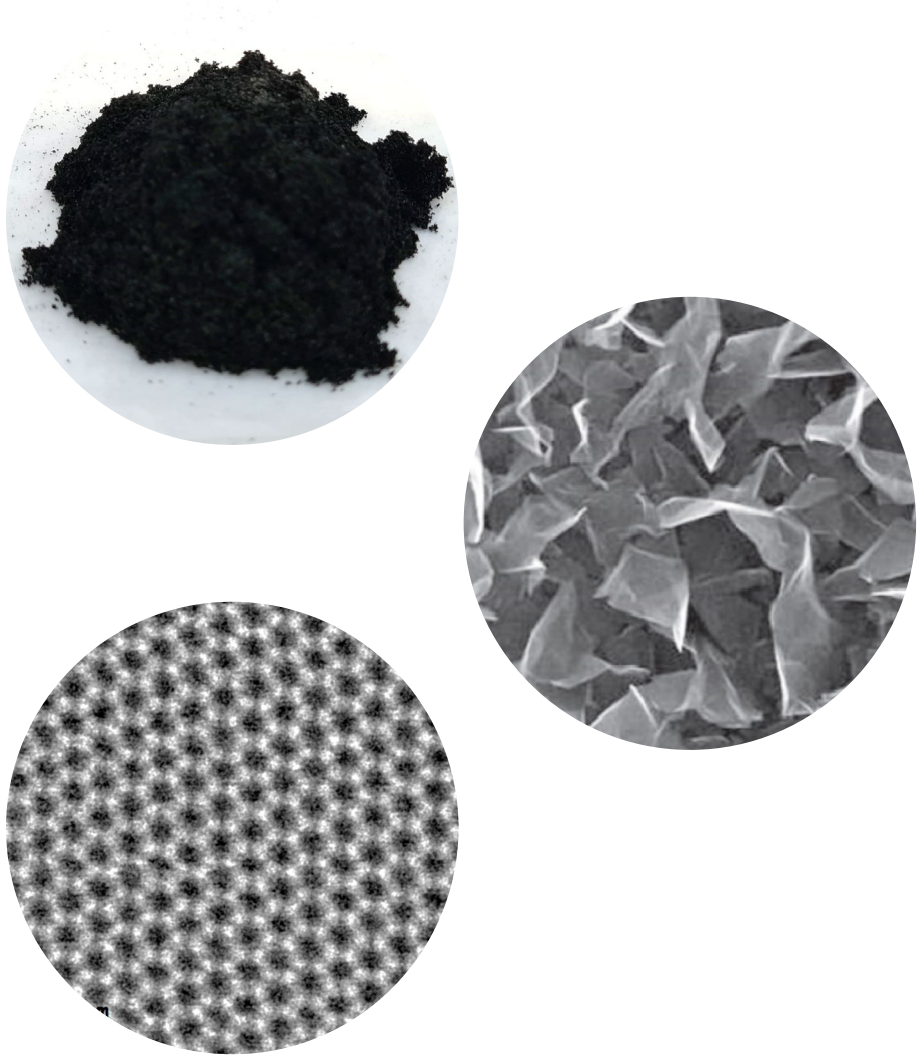


- Activated Carbon.
- Mainly derived from coconut industry waste or synthetic porous carbon.
- Good gravimetric capacitance (~ 100 F/g).
- Poor volumetric capacitance (50-60 F/cm^3).
- 20-100 USD/kg.

Current State of the Art

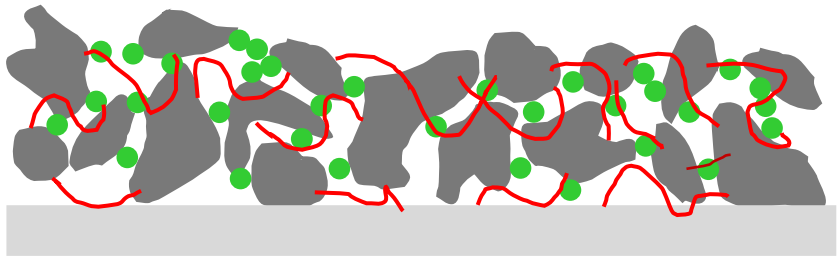


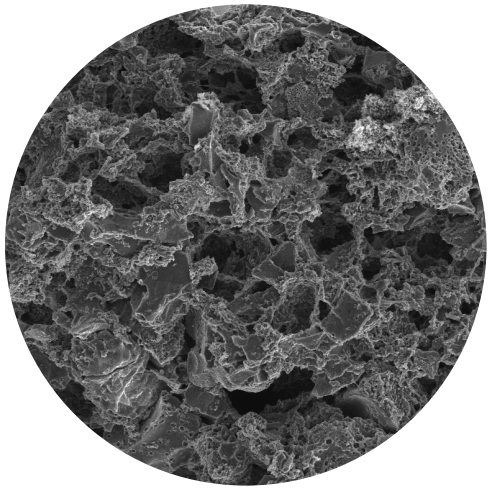
Graphene



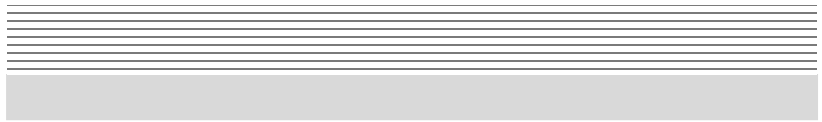
- Single layer of Carbon.
- Mainly derived from exfoliation of layers of Graphite through different methods or deposition from a gas phase.
- Highly conductive.
- Comparable cost to Activated Carbon.

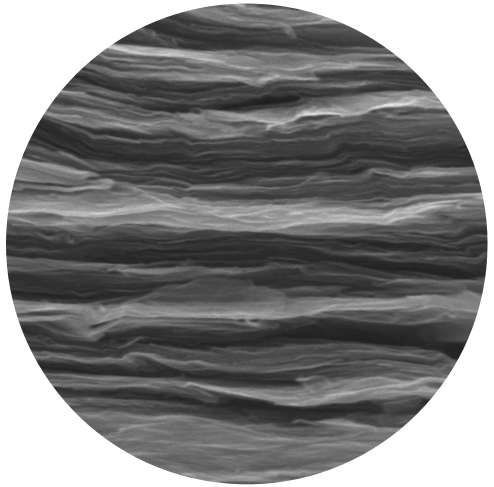
Structure and Capacitance





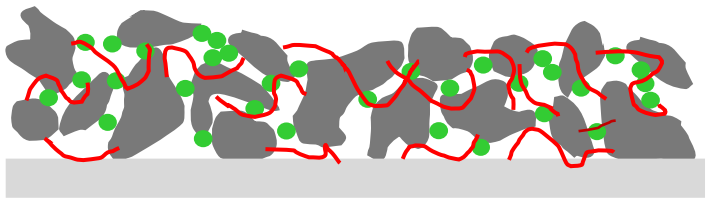
- Poor packing
- Low volumetric capacity

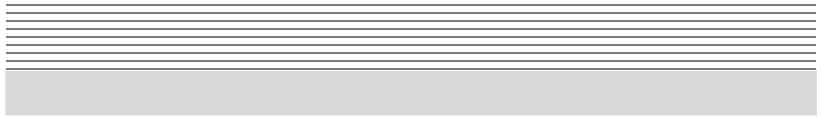


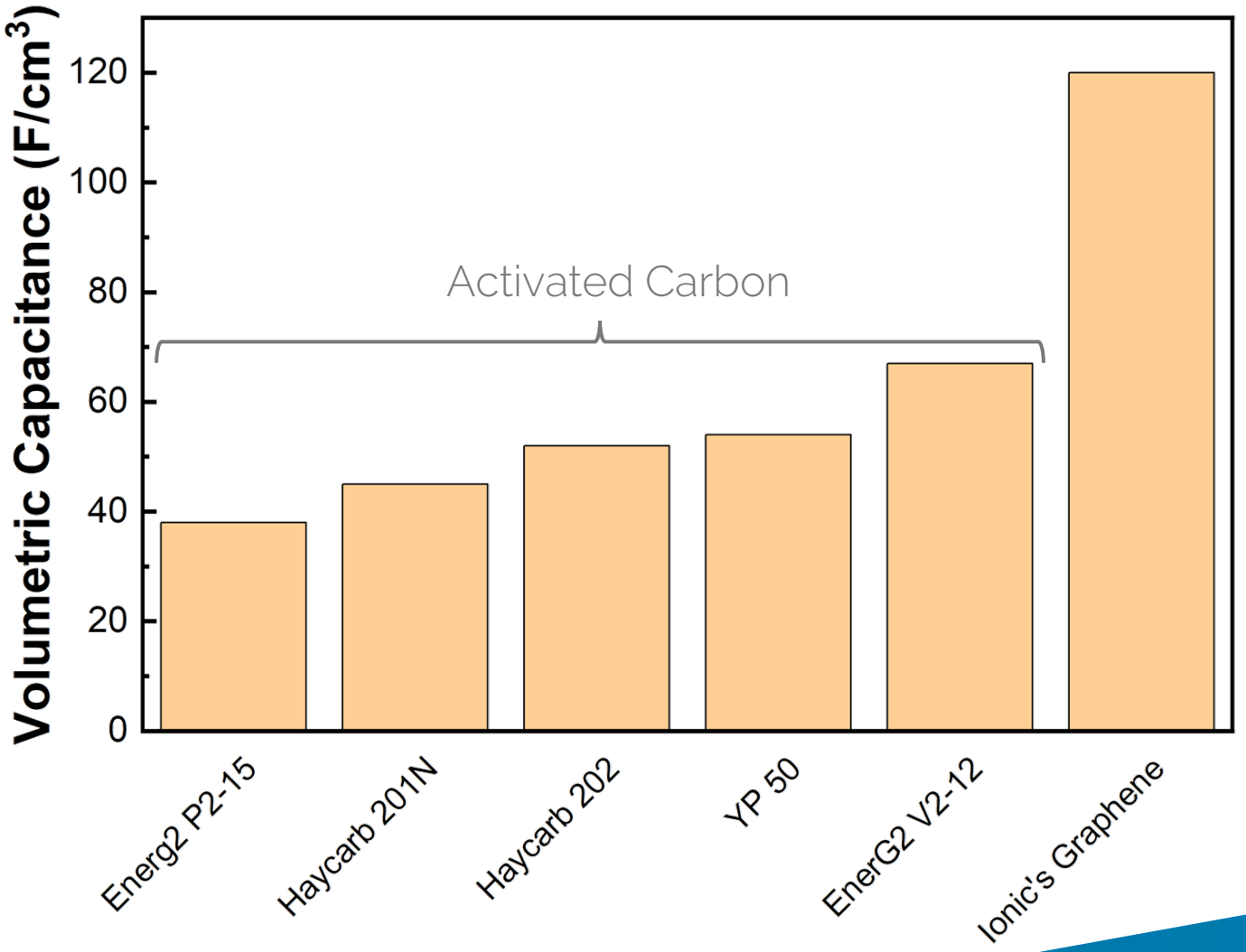


- Good packing
- High volumetric capacity

Structure and Capacitance







Ionic's Technology

- Ionic Industries has developed graphene electrode materials for EDLCs with twice the capacitance of state-of-the-art activated carbons.
- When built into large format soft-pack cells this makes them 50% thinner with 80% more energy (Wh/L) on a drop-in basis – easily exchanged with existing devices.
- Ionic Gen1 technology is not yet optimized for minimum ESR and maximum capacitance and further improvements are likely, even in the short term.

Ionic's Technology

Specification		Prismatic		Skelcap
		Ionic Gen1	Generic AC	Can
Capacitance	*F*	3200	3200	3200
ESR	*mOhm*	0.09	0.06	0.14
Length	*cm*	19.5	19.5	13.8
Width	*cm*	13.0	13.0	6.0
Volume	*L*	0.25	0.46	0.39
Thickness	*mm*	10.0	18.1	n/a
Weight	*kg*	0.44	0.38	0.53
Capacity	*Ah*	1.8	1.8	1.8
Voltage	*V*	3.0	3.0	3.0
Energy	*Wh/L*	14.3	7.8	9.3
	Wh/kg	8.1	9.4	6.4
Power	*kW/L*	100	87	29
	kW/kg	57	68	49

ionic industries

The Ionic Team

Simon Savage (MBA, MAICD)

Managing Director

Led Ionic since 2016, with world-leading, novel strategies for commercialising university born technologies. Founder and Director of the Australian Graphene Industry Association.

Peter Armitage (FCA, FAICD)

Executive Chairman

Experienced company director, specialising in governance and financial management with a long history in Australian listed companies with strong Business strategy credentials.

Dr Phillip Aitchison

Technology Director

One of Australia's first and most highly recognised commercial graphene scientists and a leading expert in the field of supercapacitor technologies.

Paul Zientek

Director Manufacturing and Operations

Specialising in advanced coating technologies and manufacturing operations with a background in some of Australia's leading technology success stories including manufacturer of Australia's polymer bank notes.

Professor Mainak Majumder

Monash University, Chief Scientific Advisor

World-recognised materials scientist, specialising in carbon and graphene. Director of the newly-formed Australian Government funded Industry Transformation Research Hub on Advanced 2D Materials.

Dr. Meysam Sharifzadeh

Research and Development Manager

Over 10 years working on advanced materials and graphene energy storage systems in Australia and Singapore, specialising in supercapacitor materials processing, device fabrication and prototyping.

ionic industries

Business Model

Collaboration-based commercialisation model:

Focus on our core strengths in the development of graphene materials for specific energy storage and sensing applications.

Partner with industry leading companies to bring technologies to target markets much faster than we could ourselves.

Enables us to **retain control of our IP while leveraging value** from further along the value chain.

ionic industries

Thank you.

SIMON SAVAGE

Managing Director

simons@ionicindustries.com.au

+61 402 388 702