

# Green Science Alliance



**Cutting Edge Materials and Technologies to Build Sustainable,  
Carbon Neutral, Energy and Environmental Friendly Future**

**Black Mass based Recycled type Lithium Ion Battery**

# Our Energy, Environmentally Friendly Technologies to Build Carbon Neutral, Sustainable Society



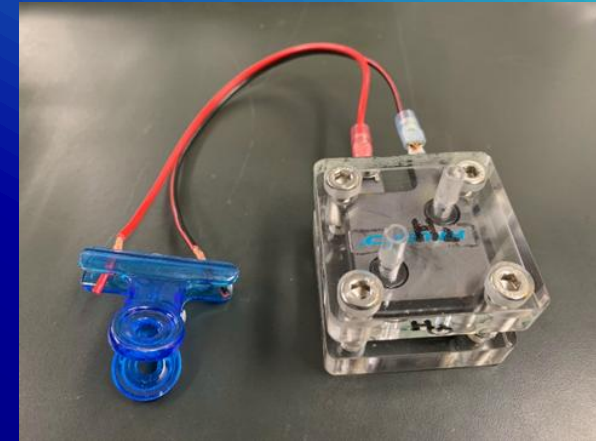
**Plant, Biomass based Materials,  
Biodegradable Plastics etc...**



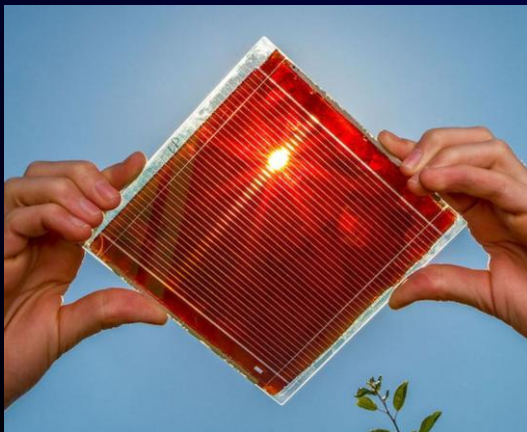
**Quantum Dots  
Quantum Dots  
Cosmetics etc...**



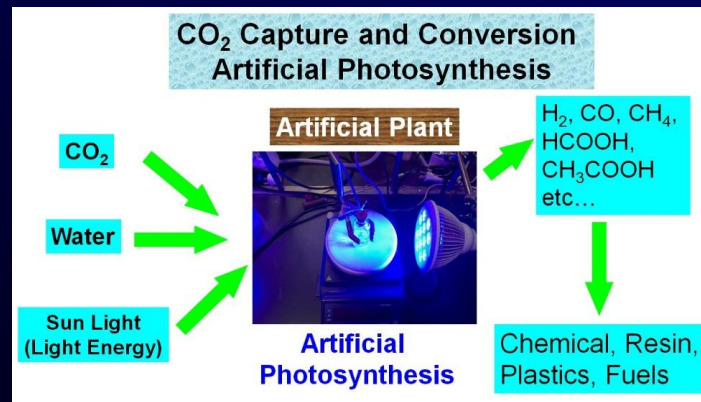
**Next Generation  
Rechargeable Battery**



**Platinum less Fuel Cell**



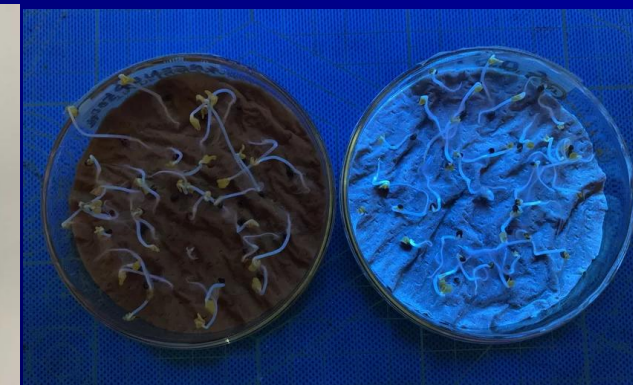
**Materials for Perovskite  
Solar Cell**



**CO2 Capture and Conversion  
to Energy and Chemicals**



**Water Harvesting Device  
from the Air  
with Metal Organic  
Framework**



**Quantum Dot Nano  
Fertilizer  
Cellulose Fiber  
Biochar, Biodegradable  
Agricultural Film**

**Lithium Ion Battery**

**Next Generation  
Rechargeable Battery**

**Should be**  
**Stronger**  
**Work longer**  
**Higher Durability**  
**Better Cycle Characteristics**  
**Safer (non Flammable)**  
**Cheaper**  
**than Lithium Ion Battery**

All Solid State Battery  
Solid Electrolyte: Polymer, Sulfide, Chloride  
Oxide (NASICON, LISICON, LLTO, **LLZO**) etc...

## Post Lithium Ion Battery Candidate

Metal Ion Battery besides Lithium : Na, Mg, **Al**, Ca, K, Si etc...

Metal-Air Battery : Lithium-Air, Mg-Air, , Zn-Air, **Al-Air**, Fe-Air Batteries

**Lithium Sulfur Battery, Aluminum Sulfur Battery**, Na Sulfur Battery

Fluoride based Battery

New Materials for Lithium Ion Battery : **Li rich Cathode, SiO Anode,**  
**Metal Organic Framework derived Anode** etc...

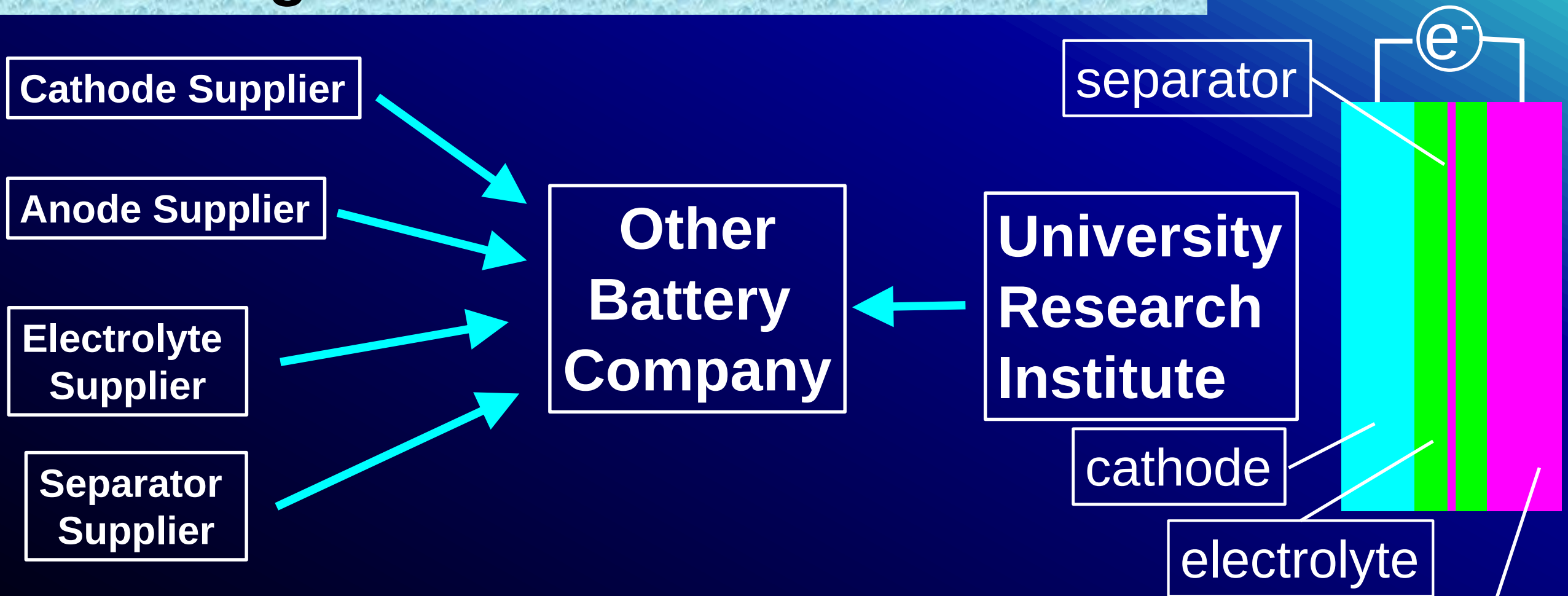
Redox Flow Battery

**Black Mass based Lithium Ion Battery**

etc...

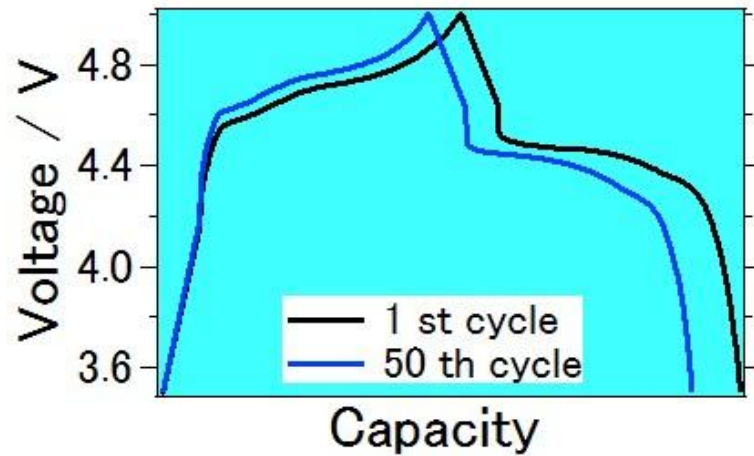
We Develop Batteries Written in **Green** Letter

# Advantage of Green Science Alliance

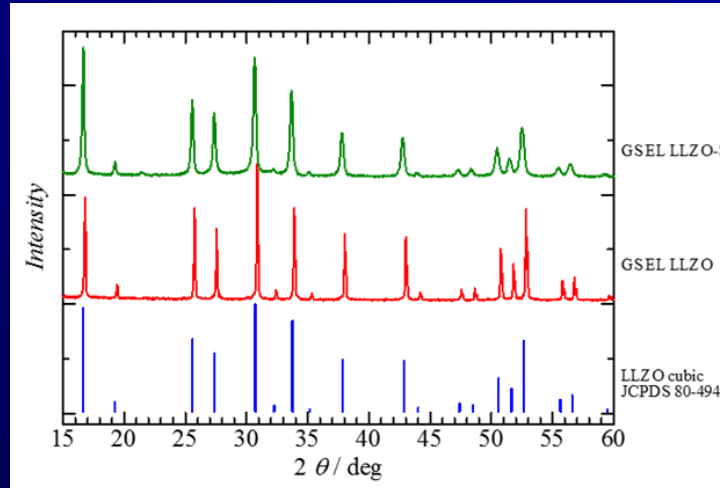


**We can Synthesize, make all of 4 Battery Components (Cathode, Anode, Electrolyte, Separator) and perform University Level Research by Ourselves**

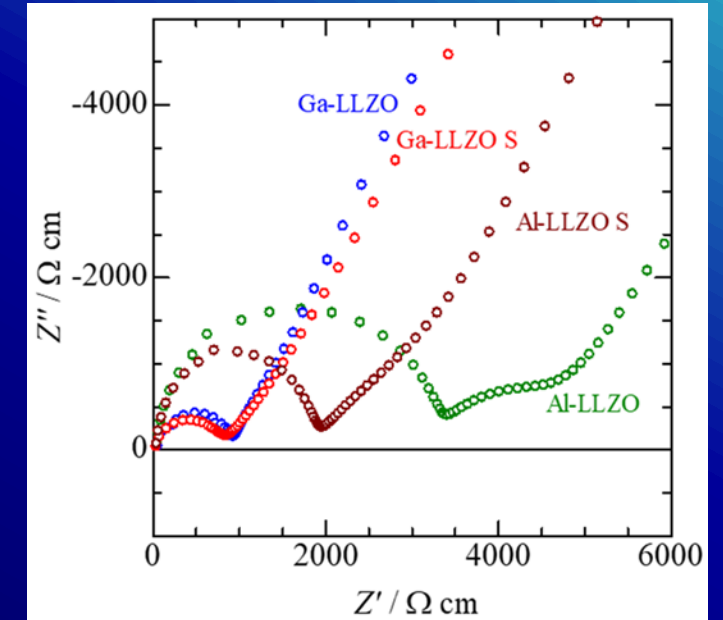
# Detail High Level Research like Universities



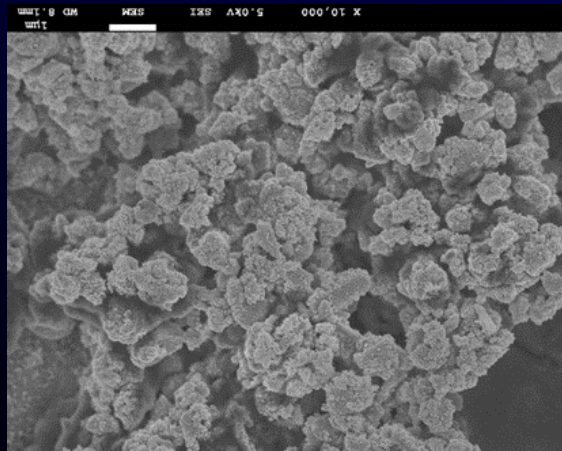
cell capacity measurement



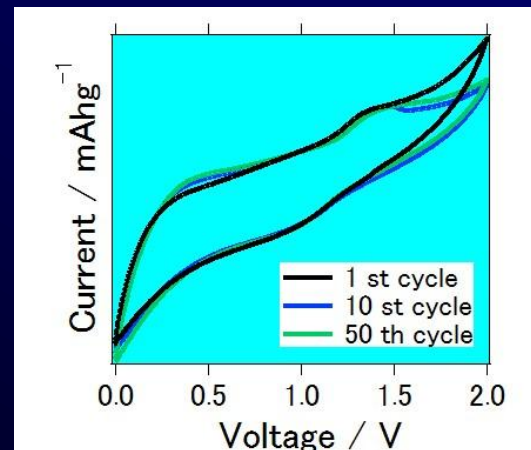
crystallinity analysis with XRD



Impedance analysis of prepared Cell as internal resistance



SEM observation



Cyclic voltammetry as electrochemical analysis

Electrochemical measurement  
X ray analysis  
Electron microscope  
EDS  
XPS  
Particle size measurement  
IR  
and other analysis

# Our Rechargeable Battery Products

**1. Black Mass based Recycled type  
Lithium Ion Battery (LIB)**

**Ready for Mass Production**

**2. Li rich Cathode**

**3. SiO anode**

**4. Metal Organic Framework based Anode**

**5. Solid Electrolyte (LLZO)**

**Need a little more Research for Business**

**6. Lithium Sulfur Battery**

**7. Aluminum based Rechargeable Battery**

**Still under Development**

# Lithium Ion Battery Recycling to get Black Mass



Used Lithium Ion Battery



Lithium Ion Battery Scrap



**Black Mass** mainly originated from cathode of recycled lithium ion battery. Main components are **Lithium, Nickel, Cobalt, Manganese.**

# Competitor Process



**There is no recycled type lithium ion battery in the world yet**

# Our Process

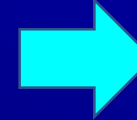
**Black Mass**



**Green Science Alliance**  
Direct Synthesis Procedure  
Safer  
lower cost  
Harmless to Environment



Cathode



Recycled Lithium Ion Battery  
made with Black Mass

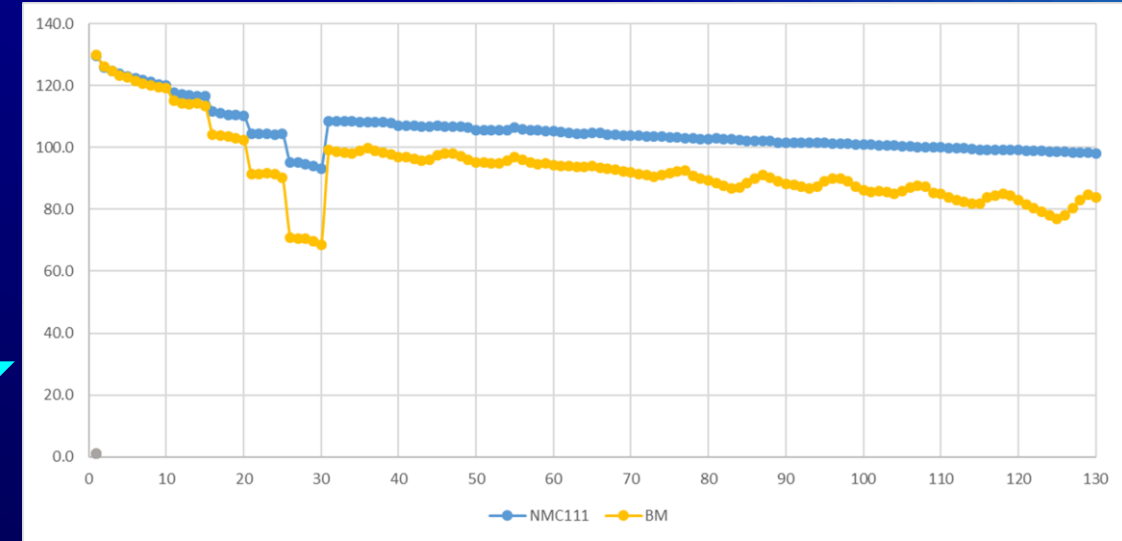
Can be cheaper than commercial lithium ion battery  
because process is so simple and safe

Recycled type lithium ion battery. First time in the world !!

# Recycled type Black Mass based Lithium Ion Battery

Initial capacity : 88 – 92 % of fresh lithium ion battery

Capacity after 100 th cycle : 90 – 93 % of fresh lithium ion battery



**Conclusion : Can be used as Recycled type Lithium Ion Battery  
Cheaper than commercial lithium ion battery**

**All the lithium ion battery in the world can be replaced with our recycled type lithium ion battery ?!**

# Ready for Production (Black Mass based Lithium Ion Battery)



**Pouch Cell**



**Battery Package**

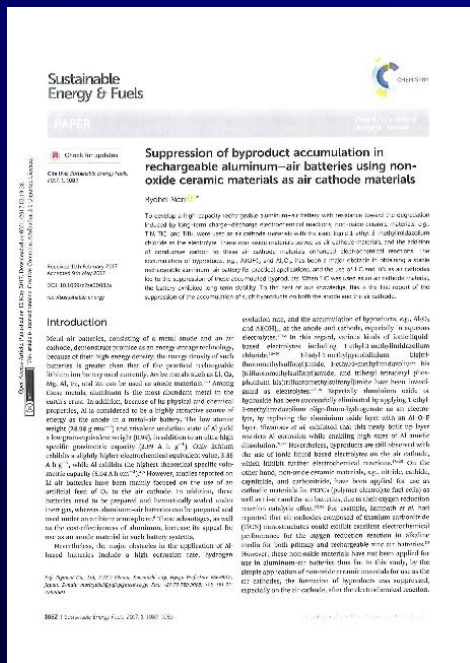
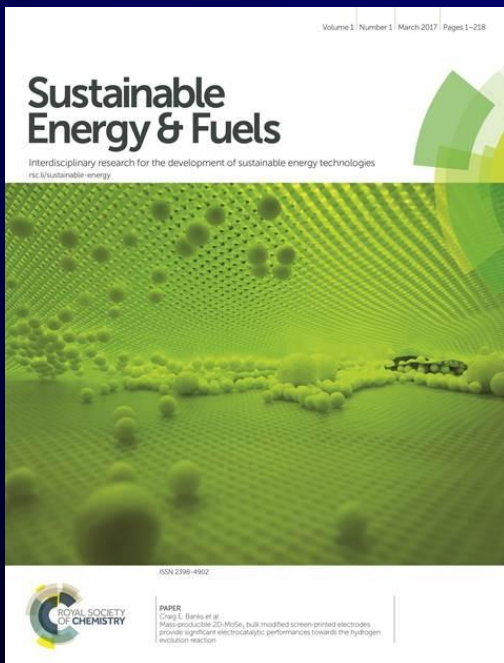


**Further Research**

**Manufacturing Machines and Factory Researcher  
Further Research to improve Battery Properties**

**We are preparing to manufacture in Japan and Switzerland**

# Some of Scientific Papers written by CEO : Dr. Ryohei Mori



- R. Mori, *RSC Adv.*, 2013, **3**, 11547–11551.
- R. Mori, *RSC Adv.*, 2014, **4**, 1982–1987.
- R. Mori, *RSC Adv.*, 2014, **4**, 30346–30351.
- R. Mori, *J. Electrochem. Soc.*, 2015, **162**, A288–A294.
- R. Mori, *J. Appl. Electrochem.*, 2015, **45**, 821–829.
- R. Mori, *J. Electron. Materials*, 2016, **45**, 3375–3382.
- R. Mori, *RSC Advances*, 2017, **7**, 6389–6395.
- R. Mori, *Sustainable Energy Fuels*, 2017, **1**, 1082–1089
- R. Mori, *ECS Trans.* 2017, **80**, 377–393
- R. Mori, *Phys. Chem. Chem. Phys.*, 2018, **20**, 29983–29988
- R. Mori, *RSC Adv.* 2019, **9**, 22220–22226
- R. Mori, *Electrochemical Energy Reviews*, 2020, **3**, 344–369
- R. Mori, *J. Solid State Electrochem.* 2023, **27**, 813 – 839.
- R. Mori, *Mater. Renew. Sus. Energy*, 2024, **13**, 109 – 132

Necessary patents were taken in Japan and Internationally.

# Switzerland Branch

## Swiss Battery Technology Center



Lithium Ion Battery Waste  
Taken from Used EV

Robot  
AI Technology



Black Mass

Recycle



Black Mass based  
Lithium Ion Battery

EV made from Black Mass based Recycled type Lithium Ion Battery

# Thank you !!



## Green Science Alliance Co., Ltd.

**Establishment: 2010**

**(Fuji Pigment Co., Ltd. as base Company was Established in 1938)**

**Annual Sale: approximately 0.4 – 0.5 million USD,  
35 – 40 Million USD for Fuji Pigment Co., Ltd.)**

**Number of Employees : 12, For Fuji Pigment Co., Ltd. : 110**

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