Quasi solid – state Magnesium Ion Batteries (QSSMgBs)

Problem addressed

- Dependency on scarce resources
- Low ion conductivity in solid sate electrolytes.
- High production cost
- Limited recyclability and reusability of existing technologies.
- Capacity loss and reduced performance over the time
- Cycle instability
- Safety concern
- Thermal instability

Inventor(s):

Kaushik Palicha
Harinipriya Seshadri

505, Fifth Floor Delta Wing,
Raheja Towers, Anna Salai,
Chennai, Tamil Nadu - 600002

Intellectual Property:

Indian Patent
202241033599
(Under Examination)

PCTIN2023050551

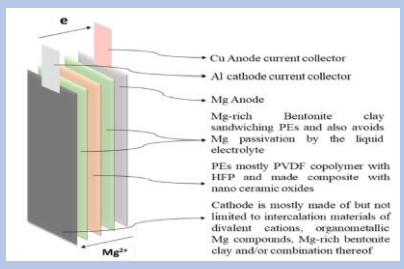
Technology:

The current technology is a Quassi solid-state Magnesium silicate battery (QSSMgBs) made with locally available phyllosilicate.
The battery comprises of:

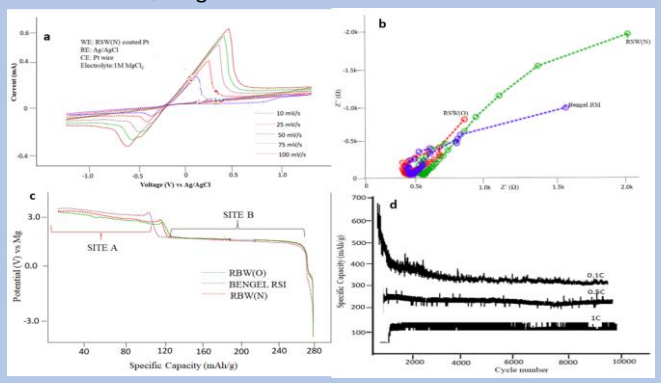
1. **SSE: Quasi state electrolyte** Mg-enriched Bentonite Clay deposited on either side of PP membrane
2. **Cathode**: Mg-rich phyllosilicate
3. **Anode:** Mg metal

Application

- ✓ e-mobility
- ✓ Electronic applications
- ✓ Stationary storage applications
- ✓ Toys
- ✓ Drones



Schematics of QSSMgBS



Figures

a) Electrochemical process
b) Ionic conductivity of the phyllosilicates.
c) Potentiodynamic studies of phyllosilicates
d) GCD Profile

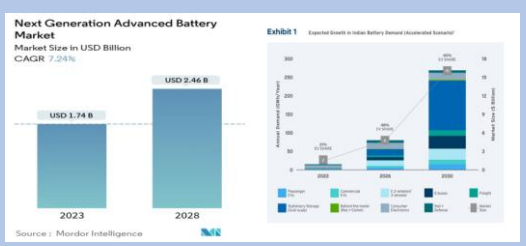
Category of the invention:

- ✓ Electrical
- ✓ Clean Energy
- ✓ Battery Technology
- ✓ Next Generation Transportation
- ✓ Green Technology

Advantage

- ✓ Utilization of earth abundant and naturally available material
- ✓ Environmental friendly
- ✓ Avoids formation of complex chloride ions such as $[MgCl_4]^{2-}$ that hinders the solid phase diffusion of Mg^{2+} ions
- ✓ Increased electrode kinetics on the cathodic surface
- ✓ Enhanced gravimetric energy density of the order of three times the value reported so far in the state-of-the-art in the literature
- ✓ Excellent cyclability of about 10,000 cycles
- ✓ enhances the specific capacity
- ✓ The bentonite clay acts as a good Mg^{2+} storage material at the electrical double layer.

Potential Value



Source:rMordor Intelligence

Image Source:Image: RMI / RMI India / NITI Aayog.

USP

- ✓ Completely recyclable
- ✓ Low production cost
- ✓ 110 mAh/g upto 10 k cycles @ 1C
- ✓ Gravimetric Energy Density: 0.888 kWh/kg
- ✓ Areal Capacity: 20.48 mAh/cm^2
- ✓ Longevity: 30 days @ 0.1 C
- ✓ Ionic conductivity of electrolyte is 2.87 mS/cm
- ✓ Ionic conductivity of Cathode Active material: 2.54 mS/cm

Reach Us:

Dr. Amaresh Panda
Lead, Technology Transfer Office, KIIT-TBI
amaresh@kiitincubator.in | +91-9819053408

Dr. Samuel Rout
Manager, Technology Transfer Office, KIIT-TBI
samuel@kiitincubator.in | +91-7735389456

tto@kiitincubator.in | tto.kiitincubator.in