Sodium-ion batteries

Addressing the pitfalls of conventional energy storage solutions

Energy Ville

IMO-IMOMEC

UHASSELT

imec

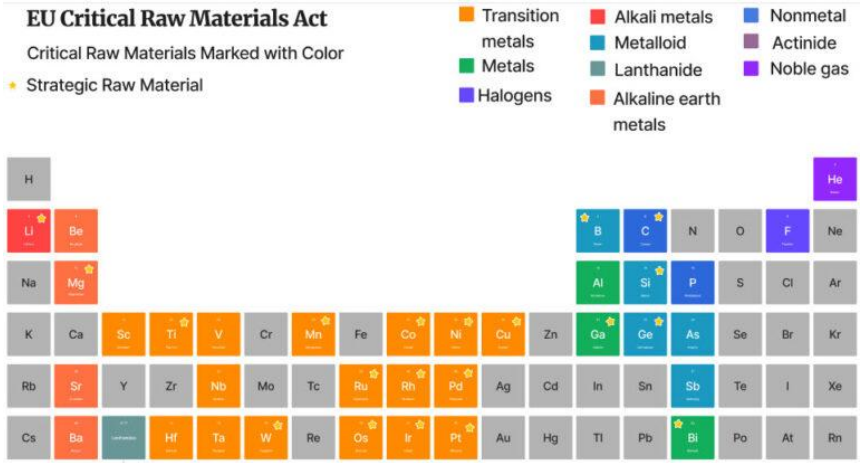
Sodium-ion batteries

Addressing the pitfalls of conventional energy storage solutions

Renewable energy storage enables a sustainable world, but..

Lithium-ion batteries have their challenges

- Contain CRMs (Li, Co, Ni, etc.)
- Are a fire hazard
- Are difficult to recycle
- Contain PFAS
- Require toxic solvents

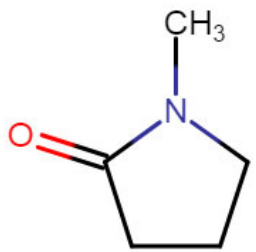


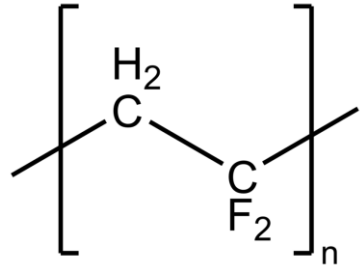
HLN

Twee personen gewond nadat fietsbatterij vuur vat in appartement

In de Hippolyte Boulengerlaan in Ukkel heeft afgelopen nacht een brand gewoed in een flatgebouw. Daarbij raakten twee personen bevangen door de rook. Eén appartement is door de brand ook minstens tijdelijk onbewoonbaar. Oorzaak van de brand was een oververhitte batterij van een elektrische fiets. Dat meldt de Brusselse brandweer.

Carmen Schelkens 17-05-24, 13:41





IMO-IMOMEC
UHASSELT imec

Energy Ville

Sodium-ion batteries

Addressing the pitfalls of conventional energy storage solutions

Sodium-ion batteries: safe by design, design to recycle

Compared to LIBs

- Cheaper, safer
- Acceptable energy density
- Moderate weight
- Possibly yield faster charging
- Wider operating range (-20 ➔ +60°C)
- Al foil as current collector for both electrodes

>100 Wh/kg

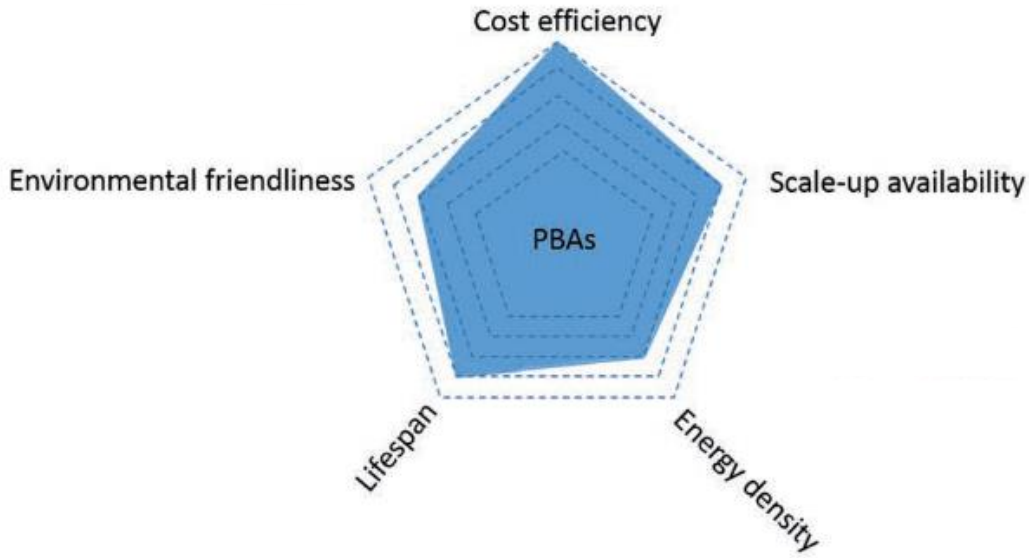
>250 Wh/L

>1000 cycles

Sodium-ion batteries

Tasks ahead

1) Material improvement by controlled synthesis
   - Sustainably resourced hard carbon / Na metal anodes | Non-flammable (solid) electrolyte | Prussian blue analogues / layered oxides
2) Acceleration of materials uptake by industry – upscaling
   - Predictive synthesis, data driven methods
   - Cost, yield, TEA
   - Environmental aspects, LCA, toxicity assessment
3) Electrode processing and modelling
   - Slurry formulation, novel processing methods
   - 3D structured current collector
   - Modeling electrode properties
4) Pouch cell integration
   - Full cell performance can greatly differ from half cell
5) Recycling
   - Hydro, pyrometallurgy, direct recycling, novel methods



Liu et al. Adv Func Mater 2020.

Sodium-ion batteries

Expertise offered by UHasselt – IMO-Imomec / Energyville

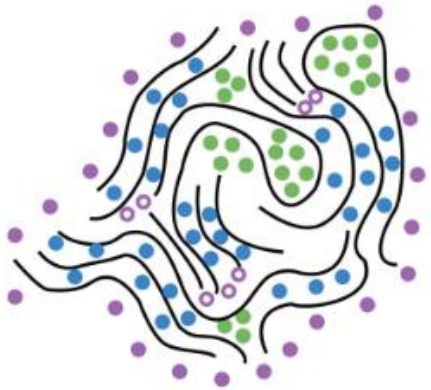
- General liquid phase synthesis expertise
- Experience in liquid and solid electrolytes for SIBs
- Electrode processing and modeling
- Pouch cells designed for recycling
- Machine learning on small data sets

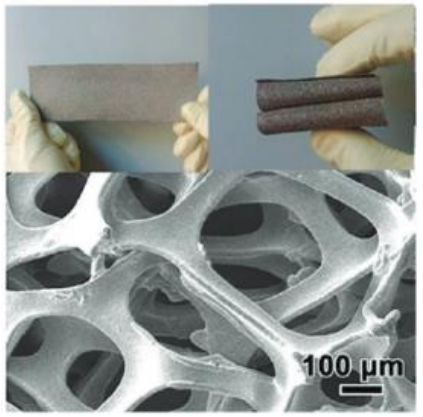
IMO-IMOMEC UHASSELT imec Energy Ville

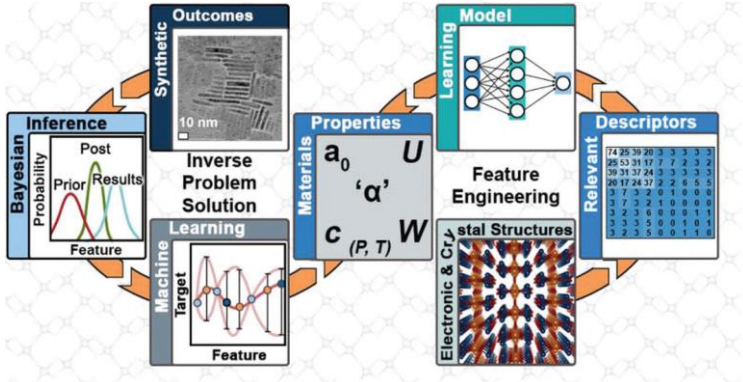
Sodium-ion batteries

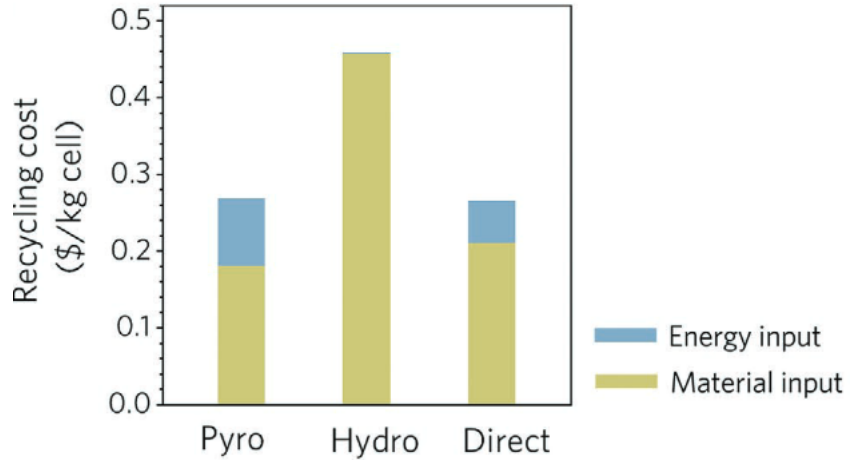
Expertise needed

- 3D structured current collector
- Hard carbon from sustainable sources
- Sodium metal passivation
- Recycling
- Data science
- TEA
- LCA
- Toxicity
- …









Jin et al. Adv Mater 2018. Braham et al. Dalton Trans 2020. Xu et al. Adv Func Mater 2023. Chen et al. Carbon Energy 2020.