Zinc-Cerium Redox Flow Batteries

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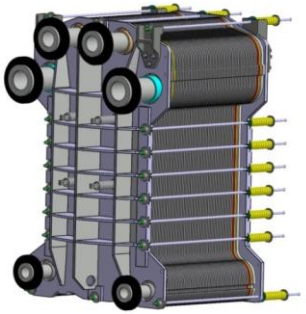
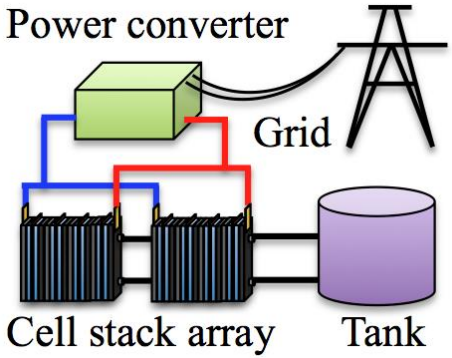
Redox flow batteries (RFBs)

- Rechargeable energy storage devices.
- Energy is transferred into redox species dissolved in an electrolyte.
- Electrolytes are stored in reservoirs outside the cell, **no volume limit.**

RFB reactor by Plurion®.



RFB energy storage system.



15 MW RFB by Regenesis®.

Important applications:

- Storage of renewable energy.
- Load levelling of the power grid.
- Back up energy systems.

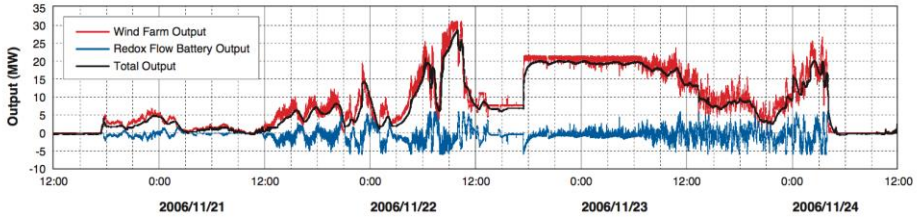
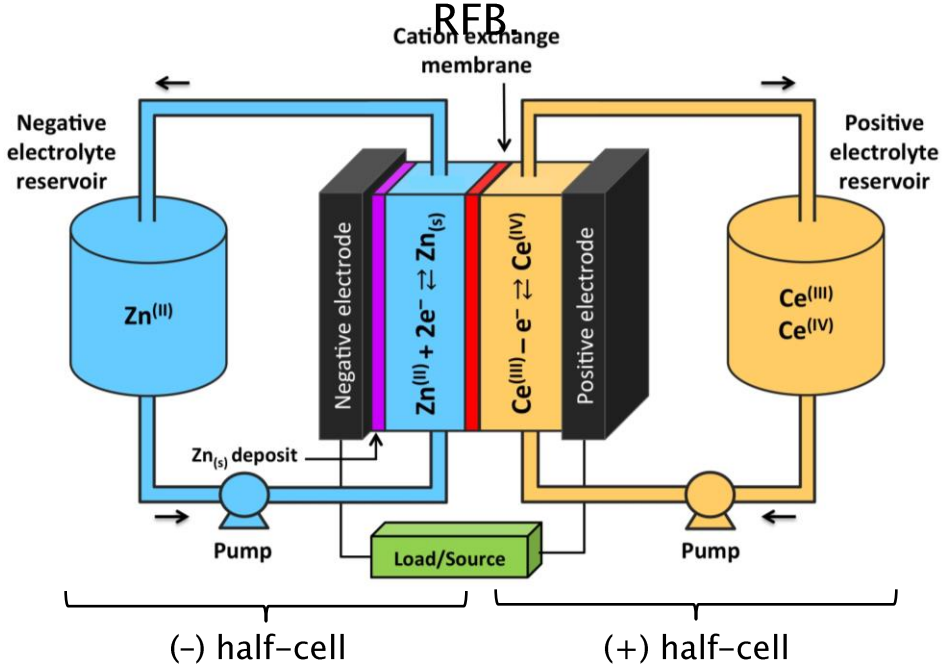


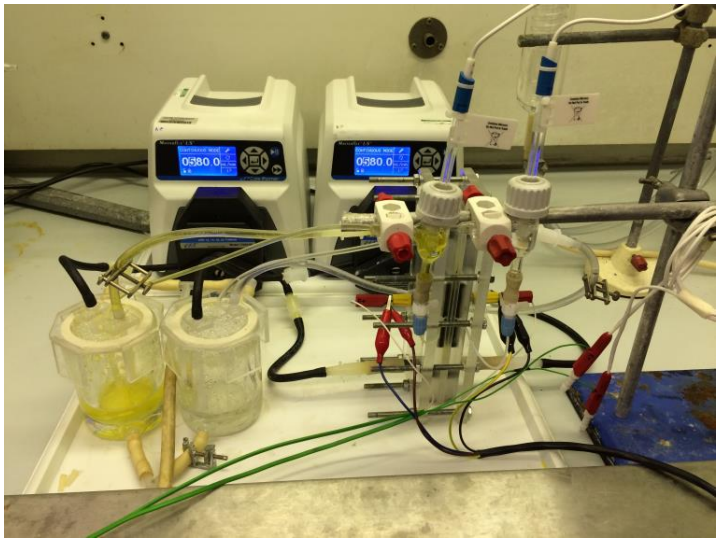
Fig. 12. Example of wind farm power output stabilization

The Zn–Ce Redox Flow Battery

E_{cell} = 2.2 V, highest of any aqueous RFB

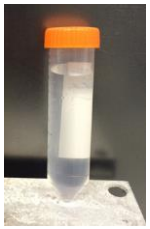


Experimental set up



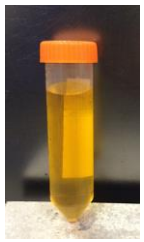
Electrolyte composition:
- 1.5 mol dm^{-3} Zn(II)
- 1.0 mol dm^{-3} MSA

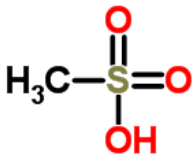
Electrode material:
- Carbon composites



Electrolyte composition:
- 0.8 mol dm^{-3} Ce(III)
- 4.0 mol dm^{-3} MSA

Electrode material:
- Platinized titanium

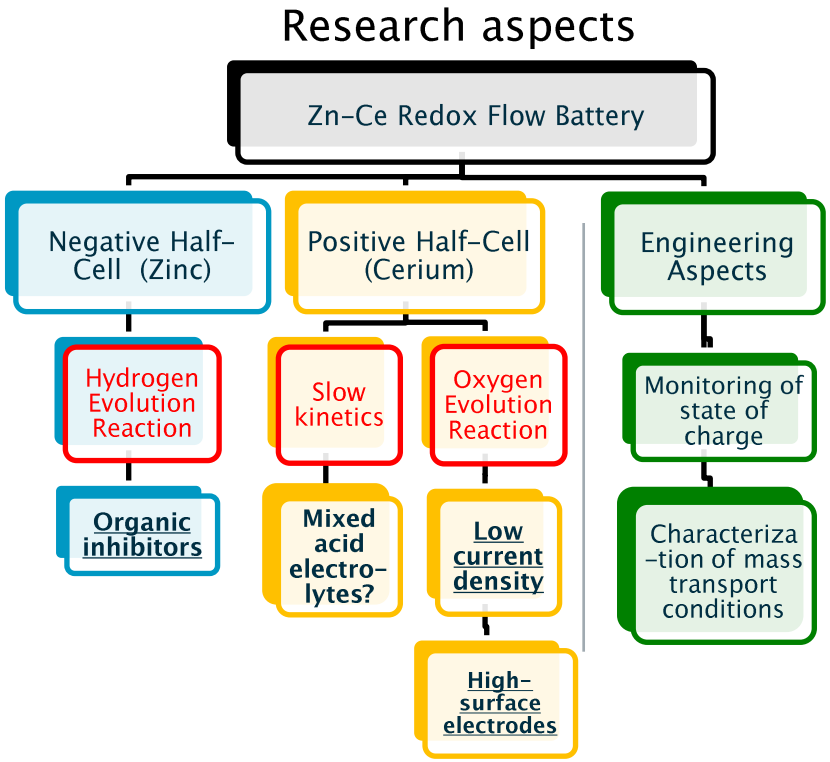




Methanesulfonic acid

- Lack of halide emissions.
- Moderate cost.

Zn-Ce RFB: Research Aspects



Papers:

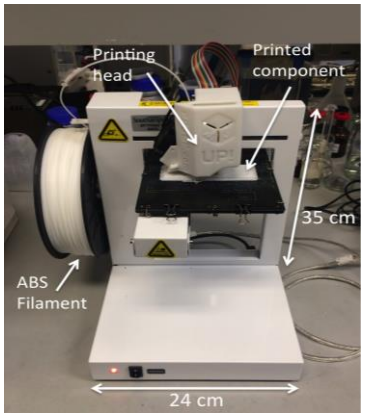
- Review of the Zn-Ce RFB.
- 3D printed cell.
- Engineering of flow batteries.

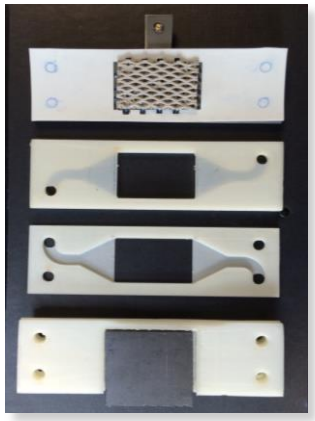
en.wikipedia.org/wiki/Zinc-cerium_battery

Experimental results:

- Conductivity/viscosity od electrolytes.
- Components of cell potential.
- Electrode materials.
- Characterization of mass transport.
- State of charge monitoring.

Flow cell prototypes manufactured by 3D-printing





Thanks for your attention. Luis F. Arenas.