

High Temperature Batteries for Venus Surface Missions

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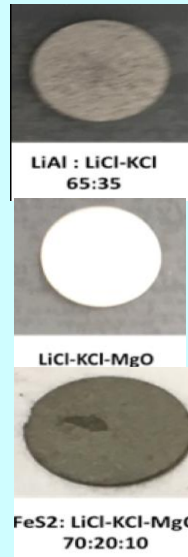
Goal and Objective

- Develop an enabling battery for Venus surface missions, (30 d at 475°C (and 92 bar).
- LISSE (NASA GRC Lander) goal; 60 days

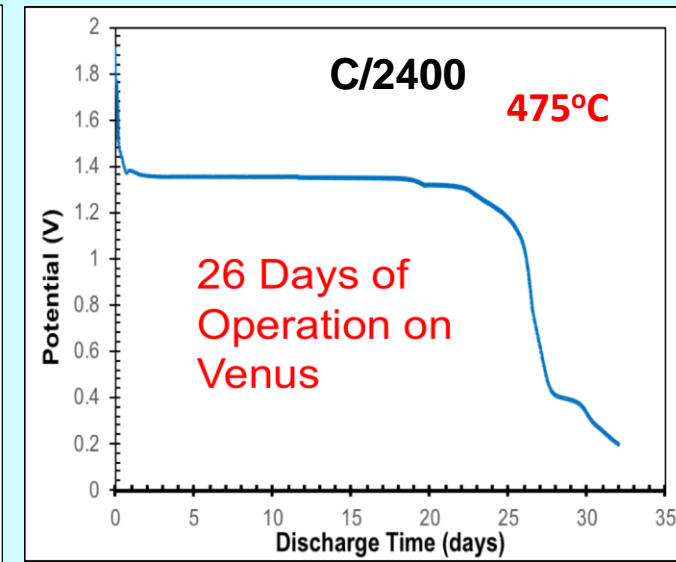
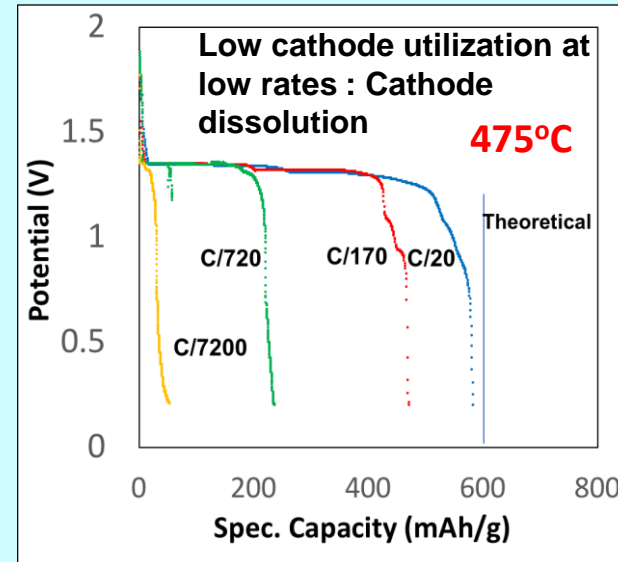
Previous Venus surface missions lasted <2 h.

Battery Chemistry

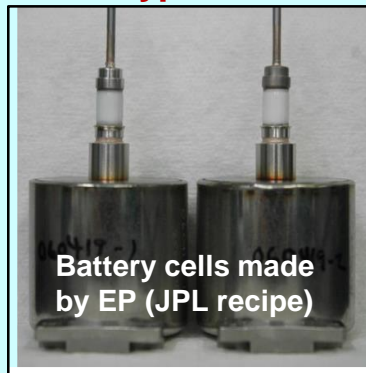
- Anode (Li alloys, e.g., Li-Al, Li-Si)
- Cathodes
 - Metal Sulfides: FeS, FeS₂, CoS₂, NiS₂, TiS₂
 - Metal Phosphorous Trisulfides: FePS₃, NiPS₃
- Molten salt electrolyte (mixed alkali metal halides)
 - LiCl-KCl (44 wt% LiCl and 56 wt% KCl) (m.p.359°C)
- Separators (MgO, Al₂O₃, Li₂O)



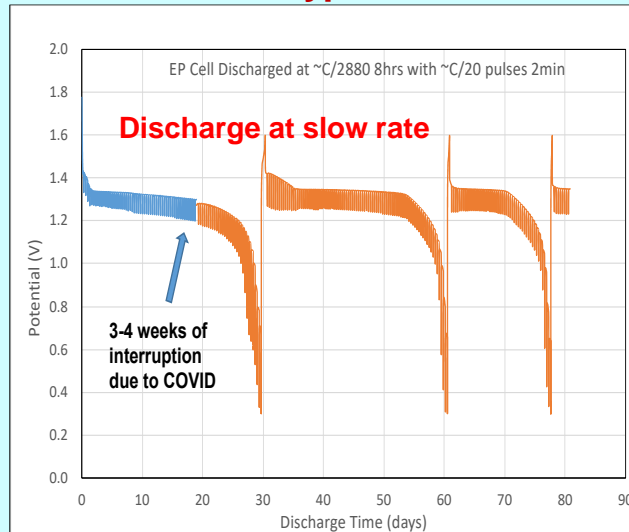
Li(Al)-FeS Laboratory cells @ 475°C



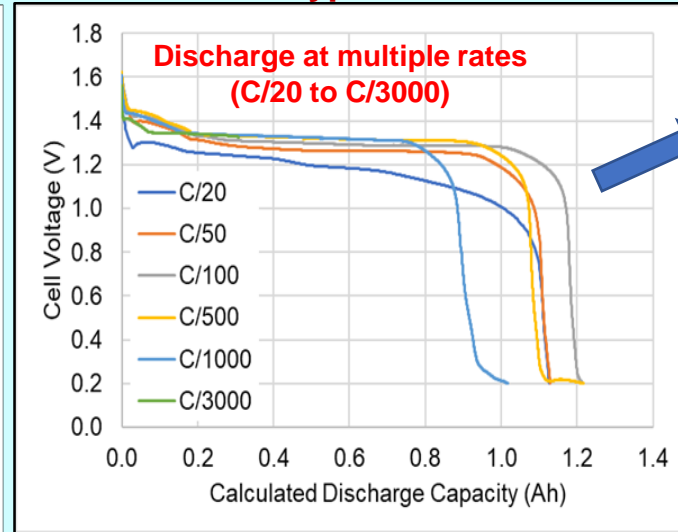
Prototype Cells



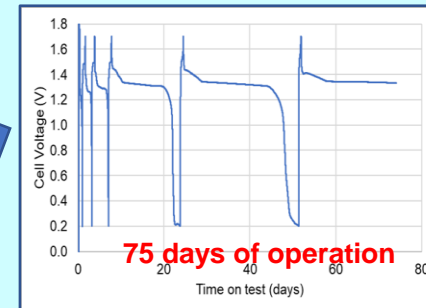
Prototype Cells



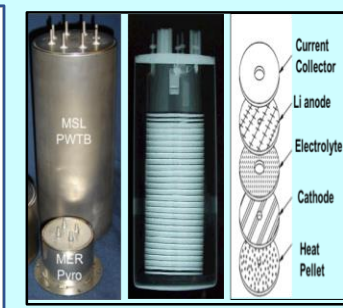
Prototype Cells



Path Towards Infusion



Thermal Batteries



- Improve chemistry for 60 day operation.
- Cathode coating shows 50% improvement
- New materials (cathodes, electrolytes)
- High pressure cell/battery design (Ti)
- Test in Venus environment (GEER)
- Bipolar cell stack, like thermal batteries
- Multi-cell battery and qualification

>100 days of operation with recharge

Enhances probe missions

- Cells fabricated with JPL recipe and materials
- Leverage from EaglePicher's expertise in thermal batteries