Ultra-low Temperature Rechargeable Li/Cl$_2$ Batteries with Thionyl Chloride-based Electrolyte

Stanford researchers at the Dai Lab have developed high performance ~ 3.5 - 4 V rechargeable Li/Cl$_2$ batteries with Thionyl Chloride Based Electrolytes that can operate between room temperature and -80 degrees Celsius and delivers up to ~ 3,000 - 4,500 mAh/g first discharge capacity and a 1,200 - 5,000 mAh/g reversible capacity over up to 130 charge-discharge cycles.

At ultra-low temperatures, current Li-ion rechargeable batteries underperform in regard to battery capacity and cycle-life. This invention addresses that problem, opening rechargeable batteries for use in cold climates, deep-sea expeditions, and space explorations.

Stage of Development

- Prototype

Figure:

Figure description: Schematic drawing of an ultra-low temperature Li/Cl$_2$ battery.
Related Technology:
Stanford Docket - S23-189 Rechargeable Sodium-ion and Lithium-ion Batteries with Thionyl Chloride-based Electrolyte

Stanford researchers make rechargeable batteries that store six times more charge, 08.25.21

Applications

- Ultra-low temperature rechargeable batteries for:
  - Electronic devices
  - Electric vehicles
  - Equipment in low temperature areas such as polar climates, subsea and space explorations

- Room temperature high energy density equipment such as pacemakers, aerospace facilities, industrial instruments, etc.

Advantages

- Ultra-low temperature operations down to -80 degrees Celsius
- Can operate between room temperature and -80 degrees Celsius
- High battery capacity and energy density
  - Delivers up to ~ 3,000 - 4,500 mAh/g first discharge capacity and a 1,200 - 5,000 mAh/g reversible capacity
- Rechargeable and can cycle up to 130 cycles

Publications

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