Solvent-free and non-flammable ceramic electrodes for rechargeable lithium batteries

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Summary/Characteristics

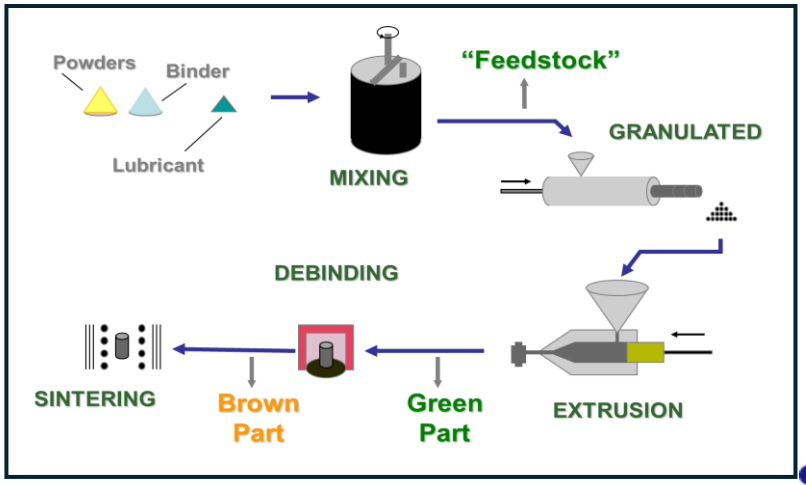
Researchers from the Materials Synthesis and Processing Group at Universidad Carlos III de Madrid have developed a method to manufacture inorganic ceramic sheets with thicknesses ranging from 50 to 2000 microns using powder extrusion molding technology, for application in rechargeable lithium batteries.

In the process, the active powder is mixed with a polymer that is later removed—unlike conventional techniques—resulting in smaller, denser electrodes with good performance at high temperatures, which increases the capacity, energy density and reliability of the batteries.

Partners from the rechargeable lithium battery sector are sought to scale up and bring the technology to the market.

Innovative Aspects

- Development of fully inorganic ceramic electrodes for rechargeable lithium batteries, completely free of solvents, binders, and organic matter.
- Non-flammable and capable of operating at high temperatures (T > 200 °C), expanding the operating range compared to conventional technologies.
- Manufactured via powder extrusion molding, a scalable process that enables the production of ceramic sheets between 500–2000 microns thick.
- Electrodes specially suited for solid-state batteries, eliminating risks associated with flammable liquid electrolytes.



Manufacturing of solid-state ceramic sheets for rechargeable lithium batteries

Competitive Advantages

- Weight reduction of up to 40% by eliminating electrochemically inactive additives.
- Higher energy capacity per area, with electrodes that—depending on thickness—can achieve up to 10 times the capacity of current commercial electrodes.
- Maximum electrochemical efficiency, as the entire electrode material is active.
- Low-cost manufacturing method, easily integrable into existing industrial processes.

Technology readiness level:

Ready for demonstration – Tests in real environments. TRL 7.

Intellectual and Industrial Property Status:

Granted Spanish patent. Title:"Electrodos para baterías recargables de litio".

Type of collaboration sought:

Funding, Manufacturing Agreements, and Commercial Agreements are sought with partners in the rechargeable lithium battery sector to scale up industrial manufacturing and develop a commercialization plan.

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