



# NEXT-GENERATION SOLID-STATE BATTERIES

Today's Li-ion wet battery technology has some room for improvement, but not enough to meet the requirements for tomorrow's electrical vehicles or stationary energy storage. So if your company is involved in the battery supply or fabrication chain, you may be looking for out-of-the-box innovation. Imec is pushing solid-state battery technology forward, with a new world-class electrolyte, compatibility with existing manufacturing processes, technology to produce denser electrodes, and a clear roadmap to industrial upscaling.

## WORLD-CLASS R&D TARGETING

- Fully solid-state batteries for mobile electronics, electrical vehicles and stationary energy storage
- A breakthrough in energy density and charging speed
- Improvements in safety, cycling, and cost
- Upscalable technology, compatible with existing battery fabrication processes

## FOCUSED RESEARCH

- Breakthrough solid nanocomposite electrolyte (SCE)
- Advanced concepts and novel materials enabling denser electrode architectures for higher energy and power density
- Ultrathin protective interface coatings for long cycle life
- Dedicated test structures for study and engineering of individual interfaces

- Modeling, design and integration of full solid-state batteries
- Upscaling to A4-sized sheets and pouch cells up to 1Ah
- Performance and reliability testing

## RESULTS AND OUTLOOK

With the new, patented electrolyte, batteries have been integrated that reset the state-of-the-art for solid-state technology. More important even is the excellent evolutionary outlook:

- Electrolyte conductivity: 10 mS/cm (with path to 100 mS/cm)
- Energy density: 200 Wh/l (targeting 1,000 Wh/l, with Li-anode)
- Charging speed: 0.5C (targeting 3C)

## WHAT WE OFFER

- Invitation to collaborate in major industry effort to realize next-generation batteries
- Backed by expertise of world's premier nanotech lab
- Full path from materials research to cell upscaling and system integration
- For material suppliers, equipment suppliers, battery manufacturers, battery system integrators and end users, such as manufacturers of battery-powered mobile electronic devices and appliances, tools, vehicles...



Solid electrolyte monolith pellets casted in a mold from imec's patented nanoporous SCE material liquid precursor

## R&D INFRASTRUCTURE

- Fully-equipped materials and interface lab
- Battery pilot line for sheet to sheet processing of pouch cells (A4-size sheets, up to 1Ah)
- 100m<sup>2</sup> dry room
- Battery testing and reliability lab
- Fully equipped labs and pilot line

## BREAKTHROUGH ELECTROLYTE – KEY BENEFITS:

Imec has developed and patented a novel solid nanocomposite electrolyte (nano-SCE) with ionic conductivity exceeding that of state-of-the-art liquid electrolytes. The key feature is a surface engineered nanoporous oxide that boosts the ion conductivity of the entrapped electrolyte:

- SCE with 1 - 10 mS/cm, with a clear path to engineer up to 100 mS/cm
- Solid electrolyte made from a homogeneous liquid precursor solution
- Non-disruptive wet application route, able to impregnate dense electrodes, with solidifying in a second step
- Resulting in optimal all-around contact for higher energy and power density
- Tunable elasticity for enhanced lifetime.



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