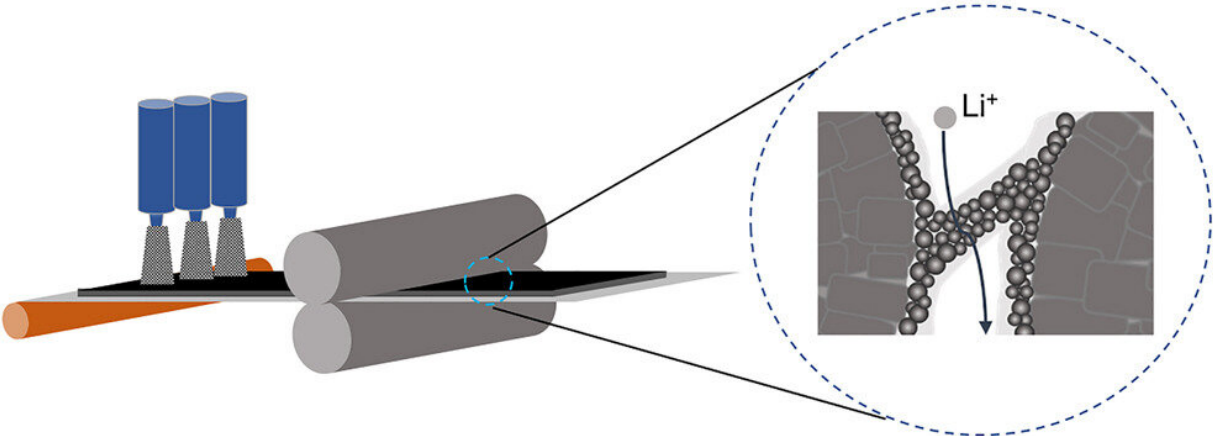


Researchers develop solvent-free process to make better, cheaper lithium-ion battery electrodes

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Dry-Printing Technology

Fast Li⁺ Diffusion Path



Non-Toxic



Low-Cost



Fast-Charging

Graphical Abstract. Credit: *Joule* (2023). DOI: 10.1016/j.joule.2023.04.006

A team led by Worcester Polytechnic Institute (WPI) researcher Yan Wang has developed a solvent-free process to manufacture lithium-ion battery electrodes that are greener, cheaper, and charge faster than electrodes currently on the market, an advance that could improve the manufacturing of batteries for electric vehicles.

In the journal *Joule*, the group reported on a dry-print manufacturing process that avoids the toxic solvents and the long drying times needed when manufacturing electrodes with slurries and conventional production methods.

Wang, who is the WPI William B. Smith Dean's Professor in the Department of Mechanical and Materials Engineering, said the new process could be scaled up and reduce [electrode](#) manufacturing costs by up to 15 percent, while also producing electrodes that can charge faster than conventionally produced electrodes.

"Current [lithium-ion batteries](#) charge too slowly, and manufacturers typically use flammable, toxic, and expensive solvents that increase the time and cost of production," Wang said. "Our solvent-free manufacturing process addresses those disadvantages by producing electrodes that charge to 78 percent of capacity in 20 minutes, all without the need for solvents, slurries, and long production times."

Commercial lithium-ion battery electrodes are typically made by mixing active materials, conductive additives, polymers, and [organic solvents](#) to create a slurry that is pasted onto a metal substrate, dried in an oven, and

cut into pieces for use in batteries. The solvents are recovered through distillation.

The researchers' process, in contrast, involved mixing together dry powders that were electrically charged so they would adhere when sprayed onto a metal substrate. The dry-coated electrodes were then heated and compressed with rollers. Skipping the conventional drying and solvent-recovery process cut battery manufacturing energy use by an estimated 47 percent, the researchers reported.

Wang has long been focused on improving lithium-ion batteries and reducing the waste they create. He co-founded Ascend Elements, a company that is developing battery recycling technologies.

More information: Yangtao Liu et al, Roll-to-roll solvent-free manufactured electrodes for fast-charging batteries, *Joule* (2023). [DOI: 10.1016/j.joule.2023.04.006](https://doi.org/10.1016/j.joule.2023.04.006)

Provided by Worcester Polytechnic Institute

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