

# 3M hopes its new powder can help unlock green hydrogen production

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3M senior research scientist Andy Steinbach held a catalyst powder that promises to unlock lower-cost green hydrogen production. Credit: 3M

A material 3M has been working on for decades could be key to unlocking cost-effective production of green hydrogen, a promising but

expensive renewable fuel source.

The product—3M nanostructured-supported iridium catalyst powder—was unveiled last month at Climate Week NYC. The powder is used when separating [hydrogen molecules](#) from water with renewable electricity, a process known as electrolysis.

Every 10 grams of the stuff can help make 10 tons of [hydrogen](#) and prevents 100 tons of carbon emissions, said 3M senior research scientist Andy Steinbach. It also reduces the amount of iridium—a rare and expensive metal that trades for \$4,000 an ounce—needed for the electrolysis process.

"There's a lot of need to reduce the cost of these systems, and we think we've found a really good solution," Steinbach said. "It's not only an opportunity for 3M but more importantly for addressing climate change."

Green hydrogen is so-called because it is made with [renewable energy](#) and does not emit carbon when burned as a fuel source—but it is very costly to produce this way and as such has remained frustratingly out of reach.

"Green hydrogen has all this promise, but it has not come up to scale," said Brian Ross, vice president for renewable energy at the Great Plains Institute. "Changes in incentives and policy ... are making a more sustainable business case."

The U.S. Department of Energy has a goal to bring green hydrogen production costs down to \$1 per kilogram by the end of the decade—at least an 80% reduction—which would make it as costly or even cheaper than conventionally produced hydrogen. The recently passed Inflation Reduction Act has a \$3 per kilogram tax credit that is expected to jump-

start green hydrogen production.

"It worked with solar and wind," Ross said of government incentives for clean energy. "We'll see in the marketplace how different technologies play out."

3M's catalyst powder is still in the early stages of commercialization, and the Minnesota-based company is working with the Department of Energy to bring it to market. Globally, green hydrogen is expected to grow ten-fold to a \$4.3 billion industry by 2026 as producers scale up.

"There's a lot of momentum in this market," said Tim Yamaya, a corporate entrepreneur at 3M Ventures. "We can solve for some of those pain points that are preventing scale, and manufacture it right here in the U.S."

Most hydrogen used today is made from natural gas ("gray" hydrogen), diminishing its positive environmental attributes. "Blue" hydrogen seeks to capture carbon emissions when it is made from natural gas.

CenterPoint Energy and Xcel Energy, Minnesota's largest natural gas providers, have launched green hydrogen pilot projects that put the gas into existing pipelines alongside natural gas—though existing infrastructure and appliances could not handle a switch to 100% hydrogen.

"This high-value and limited fuel really needs to be paired with that 10–15% of the economy that would be very hard to decarbonize otherwise," said Margaret Cherne-Hendrick, senior lead for innovation and impact at Fresh Energy.

Those uses include energy-intensive industries like steelmaking, ammonia production for fertilizer and transportation—or even in fossil

fuel refining itself, where a majority of industrial hydrogen is used.

The International Energy Agency estimates ambitious adoption could eliminate the use of 14 billion cubic meters of [natural gas](#) per year and 360,000 barrels of oil per day by 2030.

"We need to be very careful where we are pairing green hydrogen with end uses across the economy, and whenever possible we should be co-locating production with consumption," Cherne-Hendrick said. "It is still resource-intensive, with high needs for water and electricity."

Last year saw the first demonstration of steel produced using green hydrogen, and a fleet of trains running on hydrogen cells has recently begun operating in Germany.

"As someone who has been in this space for a long time, it's heartening to see the momentum," Steinbach said.

The root invention behind the catalyst powder came from a 3M scientist's work in the 1980s, Steinbach said, and about a decade ago its use in electrolysis was discovered.

If the powder can help substantially bring electrolysis costs down, green hydrogen can continue its climb.

"Cost is one of the key barriers," Steinbach said. "We're seeing a lot of progress made toward that barrier."

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