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Cameron Walker

UCSB chemical engineer to develop low-cost technologies for renewable energy storage

Coming with nearly $1 million in unrestricted research funding, a 2026 Packard Fellowship for Science and Engineering has been awarded to UC Santa Barbara's J. Tyler Mefford. The assistant professor of chemical engineering will use the support to pursue more affordable ways to store renewable energy for months at a time, a major challenge in the transition to cleaner energy sources.

Mefford is one of 20 early-career researchers this year to receive the five-year fellowship. Established in 1988, it supports early-career scientists pursuing ambitious, potentially transformative ideas. Previous fellows have gone on to receive some of science's highest honors, including Nobel Prizes and election to national academies.

"These scientists, engineers and mathematicians are asking ambitious questions about our bodies, our planet, and the technologies shaping our future," said Nancy Lindborg, president and CEO of the Packard Foundation. "At a time of significant uncertainty in the research landscape, flexible, long-term support for early-career researchers matters more than ever."

Storing renewable energy year-round

Mefford’s research focuses on a promising idea to use renewable-generated energy to store hydrogen in inexpensive liquid organic molecules, then recover that energy when it is needed.

“If we can figure out how to cycle hydrogen into liquids electrochemically, that should create very low-cost energy storage,” Mefford said.

Although solar and wind power have become increasingly economical, storing the electricity they generate remains a challenge.

“Renewables today are very affordable,” he said. “For the most part, it’s cheaper to build a solar farm or a wind farm than it is to install a new natural gas plant.”

But the transient nature of renewable energy presents a problem, Mefford explained. “When the sun sets, or the wind stops blowing, where do we get our energy from?”

In particular, Mefford wants to make the abundant solar energy generated in the summer available during the winter, when limited sunlight means a dropoff in solar energy production.

“This project is focused on developing new energy storage technologies and chemistries that could do that at really low cost,” he said. “Basically, we want to make the lowest-cost energy storage technology that has ever existed.”

Achieving that goal will require a better understanding of how different materials and catalysts influence the chemical reactions involved in storing and releasing hydrogen.

Instead of studying one material at a time, Mefford and his team want to draw inspiration from fields that take a faster-paced approach to discovery. That means screening multiple materials simultaneously to understand the underlying principles of using hydrogen to store energy in liquid form. The approach could help accelerate the development of promising materials and catalysts.

High risk, high reward

The research is still in its early stages, and the scientific uncertainties make it particularly well suited to the Packard Fellowship’s funding model.

“The Packard Foundation is very supportive of high-risk projects that have the potential to be high-reward,” Mefford said. “I am really excited to work on this, and thankful for the Packard Foundation for recognizing the potential impact of this work and for supporting research into renewable and clean energy.”

Mefford will use the fellowship to bring on additional students and to support the work of designing and building the instruments that will help his team develop catalysts, improve experimental methods and better understand the chemical reactions involved with storing hydrogen. These resources could accelerate this research at a time when the need for affordable, reliable clean energy is growing.

“We have a limited time to solve this problem,” he said. “If we really want a grid powered predominantly by renewable energy, we need to figure out how to mitigate the challenges.”

Tags
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