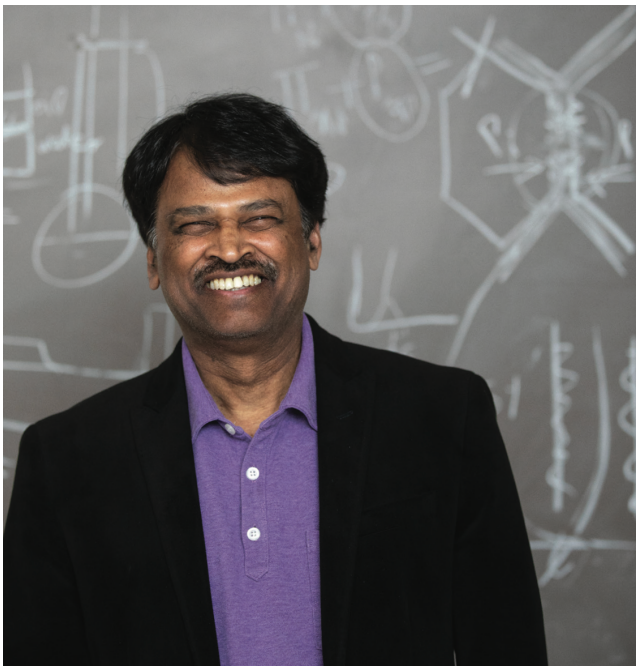
INNOVATION PLUS



THE PROTEIN PROFESSOR

BY DAVID TENENBAUM

PHOTOS BY MICHAEL P. KING

Srinivasan Damodaran arrived in the United States in 1976 from South India. He entered a Ph.D. program in chemistry at Cornell. After Cornell, he came to UW– Madison. “This is my first job,” he says. “I came here in 1984 and stayed forever.”

Quick to smile and unhurried in conversation, Damodaran (who usually goes by Damo), has made his name in fixing proteins. If you have a protein that needs a bit of engineering, he just may be your man. His various inventions include a process for the efficient removal of phospholipids (the chemicals that oxidize into an off-flavor in soy foods) and plant-based super absorbents for industrial cleanups and diapers. He has also patented a technique (along with fellow food science professor John Lucey and research associate Dani Zhu) for making protein-polysaccharide complexes that allow all the protein to stay absorbed in solution — a surprisingly difficult task.

According to Lucey, Damodaran’s productivity rests on “an amazing depth to his understanding of the basic nature of the interactions that govern protein structures, and he has combined that ability with an intellectual curiosity that allows him to derive innovative approaches to test these ideas.

“He is considered one of the world’s leading protein chemists,” Lucey continues. “He is versatile and can apply his basic skills to a wide range of topics, which has allowed him to move into different areas over the course of his long career.”

BreezeBond Soy-Based Adhesive

GREEN GLUE

In 2016, he received a request to help develop a replacement for the urea formaldehyde glues that bond plywood, particle board, cabinets, and furniture. Over the years, the multiple health impacts of airborne formaldehyde prompted first California, and then the U.S. Environmental Protection Agency, to restrict this widely used adhesive. The formaldehyde glues are cheap and effective, so the restrictions naturally increased the demand for an affordable replacement that is just as good at bonding wood sheets and fragments — but without toxic “off- gassing.”

The U.S. Forest Products Laboratory in Madison was interested in improving existing soy-based adhesives that, although strong, were not as strong as their formaldehyde counterparts and failed after absorbing moisture from the air.

To meet California’s standards and improve the glue’s environmental profile, Damodaran chose to avoid petrochemicals, focusing instead on inorganic chemistry. He settled on a chemical process called phosphorylation, which improves attachment to the cellulose in wood. “The solution was almost too easy,” Damodaran says. “It took us two or three months to demonstrate, though the optimization took much longer.”

In 2016, Damodaran and Zhu were awarded a Wisconsin Alumni Research Foundation patent for a soy-based glue that has now been licensed by California-based Specialty Organics, Inc., as part of an effort to commercialize a new soy protein–based adhesive. According to Vice President and Chemical Engineer James Seruto, the company has obtained manufacturing approval from the EPA, and is commercially scaling up the “green” adhesive with the trademarked name BreezeBond to wood panel manufacturers this year.

What distinguishes Damo as a researcher in this field is his ability to think deeply and connect the dots from fundamental sciences to solve complex problems. His research has shed light on how proteins behave and how this knowledge can be harnessed in biological systems.”

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