

Interview with Christian Adams, Ph.D.

Head of DuPont Biochemistry and Research Applications

Dr. Adams, recently you introduced new findings about your liquid detergent cellulase enzyme REVITALENZ® 200. What are these new results

Following extensive testing by a third-party institute, DuPont can now show that REVITALENZ® 200 – which hit the market in 2016 – keeps white clothes white and maintains the color of colored clothes, while protecting them from everyday wear by smoothing damaged fibers and releasing trapped dirt. This newly-proven asset builds upon the enzyme's existing benefits: pilling prevention/de-pilling properties and compatibility with protease enzymes.

Clothing is vulnerable; due to everyday wear and tear, cotton fibers break. During the wash, those damaged fibers attract dirt particles and those in turn cause white fabrics to turn gray. REVITALENZ® 200 treats this by effectively smoothing the damaged areas by removing the loose fibers and releasing trapped dirt. Specifically designed to be compatible with protease, REVITALENZ® 200 is easy to formulate and will deliver superior de-pilling at lower temperatures. This unique compatibility means that detergent manufacturers can now address fabric care needs without compromising stain removal performance.

What are some challenges detergent formulators faces?

And how can REVITALENZ® 200 help them?

In most mature markets – including North America – liquids have become the dominant product format. Cellulase is known for providing multi-cycle fabric care benefits such as pilling prevention and color maintenance.

However, detergent manufacturers face a challenge when they attempt to include both protease and cellulase in the same liquid detergent. Formulators face this obstacle because cellulases are not generally protease-resistant and will lose their activity – and therefore their benefits – when used in a detergent with a protease. Thus, detergent formulators need to choose between protease-enhanced fabric cleaning or cellulase-driven fabric care.

Therefore, an improvement of the storage stability properties of cellulase is required. DuPont used protein engineering to improve the stability of the cellulase in the presence of protease. We did this by modelling the structure of the cellulase, then generating hypotheses about the regions of the enzyme that may be susceptible to instability. We then systematically changed the amino acids in these regions and screened for cellulases with improved stability and desired performance properties.

That's how we developed REVITALENZ® 200, which is unique in the market. Due to its protease compatibility, detergent formulators can now develop a mainstream detergent that delivers on cleaning performance as well as on fabric care. Cus-

tomers alike are looking for convenient solutions to simplify their laundry routines – while keeping their clothes looking new for longer – and DuPont's enzyme helps formulators deliver.

How were those tests made to prove these claims?

These improved properties of the new cellulase were confirmed in application studies under North American wash conditions as well as storage stability trials in typical U.S. liquid detergents containing protease.

To measure protease resistance, the selected cellulase variant and competitive cellulases were incubated in liquid laundry detergents in the presence and absence of commercially available subtilisin proteases. After incubation the biochemical activity of the cellulase was measured as a function of time using standard biochemical assays (AZCL-HE-Cellulose).

To measure fabric care benefits, the new enzyme was subjected to various industry standard tests to measure pill removal, pill prevention, color maintenance and whiteness maintenance. We worked with third parties to complete some of the work.

What are the prime markets for this product?

REVITALENZ® 200 is designed to be formulated in liquid laundry detergents where the formulator is looking to deliver both fabric care and fabric cleaning benefits. DuPont tested its performance and stability in detergents and conditions from around the world.

Where can you see further advancement in detergent formulation?

The majority of the work I do is modernizing enzymes in detergents, so I will speak to that. I think the REVITALENZ® 200 story is fairly emblematic of what we will be seeing in the future for enzymes in detergent formulations. In this case, we engineered a new enzyme to perform in an environment (proteolytic) that was previously “off limits” to these types of cellulases. As biotechnology continues to develop and our pace of product development continues to increase, I expect we will see more unique and improved biotech products entering the market. I expect that these new products will be more stable and perform under conditions previously thought to be inaccessible to biotechnology – like we did with REVITALENZ® 200.



Christian Adams, Ph.D.