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OBSERVATORY

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Avoiding Premature Breakdown

You may not have noticed, but there's been a revolution of sorts going on in your washing machine over the past several decades. Laundry detergents now include enzymes -- often bioengineered ones -- that break down proteins, starches, cellulose and other components of fabric stains.

But keeping enzymes stable is a tricky business. For one thing, enzymes are proteins themselves, so a protein-destroying enzyme can destroy other enzymes in the detergent before they get a chance to work in the washer. Other chemicals in detergent can harm the enzymes as well.

Scientists at Southern Illinois University have come up with a way to protect stain-fighting enzymes in storage. Their technique encapsulates the enzymes in a protective gel. When the gel is put in wash water it dissolves easily, releasing the enzyme.

Kiranmayi Deshpande and Bakul C. Dave of Southern Illinois, along with Mark S. Gebert of Genencor, a major developer of detergent enzymes, used a sol-gel process in their research. In a sol-gel, silica particles in suspension (a colloid) are gelled to form a solid. In the gelling, other molecules can be enclosed in the solid matrix.

Sol-gel encapsulation of molecules is not new. But figuring out how the molecules can be released in a controlled way has been a stumbling block. The researchers used amino groups -- one nitrogen atom with two hydrogen atoms -- to make the resulting gels water soluble.

They found that the enzymes retained their effectiveness for long periods of time when encapsulated. But once mixed with water, they were quickly released. The findings are being published this month in the journal *Chemistry of Materials*.