

ENCAPSULATION BY DESIGN

IT'S WHAT'S INSIDE THAT MATTERS.

With Battelle's Encapsulation by Design technology, "what's inside" is limited only by your imagination.

Encapsulation encloses an active ingredient inside a tiny polymer microbead. These beads can be designed to be released by a wide variety of triggers such as temperature, pressure, dilution, pH level or the presence of specific chemicals. With encapsulation, you can:

- Protect active ingredients until they are needed
- Time the release of active ingredients to specific environmental triggers
- Combine incompatible ingredients into a single shelf-stable product.

Battelle material scientists have perfected the encapsulation process. By altering the characteristics of the polymer protective bead, we are able to design an encapsulation technology tailored to your specific ingredients and release requirements.

ENCAPSULATION APPLICATIONS

Encapsulation technology can be applied to a wide range of product challenges, such as lengthening the freshness of personal body fragrances, properly timing the release of pesticides and improving household cleaning products. Other possibilities include:

- **Agriculture:** Specific agricultural applications for encapsulation include sustained release of pesticides and fertilizers, stabilization, increased bioavailability of animal feed nutrients and seed protection.
- **Detergents and Cleaners:** Encapsulation allows incompatible ingredients such as bleaches and activators to be combined into single-step products that consumers love.
- **Oil & Gas:** We're helping the oil & gas industry fight corrosion with the Battelle Smart Corrosion Detector® bead.
- **Personal Care:** Health and beauty applications could include timed-release products or smart lotions, fragrances or deodorants triggered by UV light, temperature, pH level or water.
- **Coatings and Resins:** With encapsulation, you can create smart, self-healing coatings and single-component resin/curing agent systems.

WHAT WILL YOU ENCAPSULATE TODAY?

Encapsulation can make your product more stable, effective and convenient for end users. Call us today to find out how encapsulation can help keep your products ahead of the competition.





THE BATTELLE SMART CORROSION DETECTOR® BEAD

Corrosion costs industry billions of dollars every year. By the time corrosion is visible to the eye, the damage can be very costly to repair. We developed a smart microbead that breaks open to release self-healing chemicals in response to microscopic signs of corrosion. Existing products have separate beads for detection purposes and repair. However, the chances of both kinds of beads being in the right place to both detect the corrosion and deliver a self-healing payload are very small. The Battelle Smart Corrosion Detector® bead is the first dual-action microbead that can both detect and mitigate corrosion in a single step. Because the presence of corrosion is the actual release trigger, self-healing chemicals are always delivered exactly when and where they are needed to fill the corrosion cracks at the microscopic level. The beads come as a fine white powder that can be mixed into paints and coatings. They also fluoresce in the presence of corrosion, so inspectors can easily see early-stage corrosion using a special light, even if it isn't showing through the paint. These tiny beads provide powerful corrosion protection for pipelines, infrastructure and industrial equipment.

THE BATTELLE SMART LAUNDRY CAPSULE™ ADDITIVE: ONE-STEP COLD WATER BLEACHING

Laundry bleaches need activators in order to be effective in cold temperatures. But the bleach and activator can't be mixed in advance, or they will react with each other before the consumer adds them to the laundry. Battelle created the Smart Laundry Capsule™ additive to bring the activator and bleach together in one shelf-stable product. The activator is enclosed in tiny polymer microcapsules that can be added to liquid bleach. When the combined bleach and activator is added to the laundry, the microcapsules dissolve, releasing the activator right at the time it is needed to boost bleaching power. Combining the bleach and activator in one product makes cold-water washing easier and more convenient for consumers, and reduces packaging waste and costs. And since the polymer capsule is completely biodegradable, there are no leftover beads washed into the water supply. The microcapsules could eventually be used in a product that combines detergent, bleach and activators for true one-step cold-water washing.



Every day, the people of Battelle apply science and technology to solving what matters most. At major technology centers and national laboratories around the world, Battelle conducts research and development, designs and manufactures products, and delivers critical services for government and commercial customers. Headquartered in Columbus, Ohio since its founding in 1929, Battelle serves the national security, health and life sciences, and energy and environmental industries. For more information, visit www.battelle.org.

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