

# LOW-TEMPERATURE POWDER COATING RESINS



## OFFERING UNIQUE COMBINATIONS OF PERFORMANCE CHARACTERISTICS

Battelle has developed bio-based powder coating resins that are designed to address the expanding market for heat-sensitive substrates, such as furniture constructed with medium density fiberboard (MDF). Compared with the powder coating of more conventional metal products, heat-sensitive substrates require low-temperature cure conditions to avoid distortion or degradation of the product. Battelle's resin technology offers the ability to produce a low-temperature cure coating with a unique combination of performance characteristics including smoothness, toughness and flexibility, and durability.

### HOW IT WORKS

Battelle's low-temperature cure powder coating resins have been developed to utilize inherent chemical and physical properties of bio-based components from soybeans while providing characteristics that allow them to be processed similar to standard cure powder coating resins. As a thermally cured system, powder coating resins require a balance of particle stability and melt flow to prepare and maintain the powder formulation until its application and conversion into a final coating film.

### HOW WE DIFFER

Battelle's resin technology delivers a sustainable, bio-based option with a unique combination of performance characteristics that is unavailable among current products, including increased aesthetic features such as architectural gloss and coating smoothness, chemical resistance, mechanical properties of adhesion, toughness and flexibility, and outdoor weathering durability.

### CURRENT USE

Powder coatings are replacing traditional liquid paints and coatings for appliances, many automotive parts and a wide range of consumer goods due to the ability to avoid the use of volatile organic compounds (VOC), utilization of a highly efficient transfer process, production of thicker coatings and rapid film formation, and reduction of overall costs.

While currently a small segment of the powder coating market (<5%), heat- or temperature-sensitive substrates such as wood, plastics and composites represent an opportunity for significant market growth and expansion when provided with a suitable low-temperature coating system. For conventional metal products, lower temperature cure can be a significant factor in energy use reduction or offer increased throughput with shorter cycle times at elevated cure temperatures.

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## OTHER USES

From the outdoor weathering observed during accelerated testing, the bio-based low-temperature cure powder coating appears to possess a potentially significant improvement over super durable polyester formulations designed to have superior UV durability over standard resins and likely at a substantial price advantage over the premium ultradurable fluoropolymer systems.

Low-temperature powder coatings also can make an impact on the coating of massive metal parts, which can be impractical to fully heat to conventional cure temperatures or wait to cool to ambient conditions. Also, final coating of mixed-material assemblies present issues where there are restrictions to tolerance of the lowest temperature component.

## OUR WORK IN ACTION

Battelle is actively sampling material to industry evaluators and conducting external scale-up of the resin and powder coating formulations. The technology has progressed from small bench-scale resin batches (100 grams to 10 kilograms) to larger pilot-scale batches (10 to 70 kilograms). Initial feedback from trials and industry evaluations has been extremely favorable and is informing the direction of further resin development. Additional trials are being arranged to provide examples of the increased scale and range of potential uses on various challenging substrates. Patent applications have been filed on the resin composition and the use for powder coatings.

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800.201.2011 | [solutions@battelle.org](mailto:solutions@battelle.org) | [www.battelle.org](http://www.battelle.org)

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