Background
We are a US-based, global player and market leader in the paints and coatings industry. In industries like manufacturing, automotive, and electronics, efficient curing processes for coatings are critical. These processes often require high temperatures or extended times, which increases energy consumption and slows both the production line and the time it takes for products or assets to be returned to service. Lowering curing temperatures and speeding up curing times are key in increasing productivity and lowering energy costs. Catalysts play an essential role in this regard by reducing the energy needed for curing, allowing the process to occur at lower temperatures and faster rates.

Cure kinetics refers to the rate at which chemical reactions, such as polymerization or cross-linking, occur, causing the material to harden. This process is influenced by factors such as catalyst type, catalyst loading, temperature, and the formulation of resins, solvents, and additives. In one-component systems, curing is typically triggered by external factors (e.g., heat, moisture, or UV light), with latent catalysts activating only upon exposure to these triggers. In two-component systems, the catalyst regulates reaction rates immediately after the two parts are mixed, controlling pot-life (application window) and curing speed.

Balancing cure kinetics with pot-life (for two-component systems) or shelf-life (for one-component systems) is a significant challenge. In active coating systems, faster kinetics often shorten pot- or shelf-life, as the same chemical reactions driving cure also affect stability. The main challenge is achieving a balance between faster cure kinetics and maintaining stability.

Low-temperature curing catalysts offer promise for achieving this balance by enabling faster curing under mild conditions while preserving the material's stability during storage. However, current solutions face challenges like premature activation, inconsistent cure profiles, and limited compatibility with various resins and additives. Addressing these limitations is key to fully leveraging the potential of low-temperature curing catalysts in balancing cure kinetics with extended shelf-life and pot-life.

What we're looking for

We are looking for catalyst solutions that can lower the current curing temperature for high-temperature cure coatings, like epoxy-based powder coatings or melamine coatings, and/or achieve faster cure kinetics for low-temperature cure systems, like epoxy-amine, under the same catalyst loading as current industry-standard catalysts, while maintaining industrial shelf-life or pot-life.

Solutions of interest include:

- Catalysts (metal, organic, acid, base, latent, thermal) for melamine or epoxy systems (e.g. epoxy-amine)
- Additives (organic molecules, oligomeric, or polymeric materials), inhibitors, accelerators, and retarders for optimizing curing speed and shelf/pot-life control
- External triggers and stimuli-responsive systems, such as photo initiators, photocatalysts, microencapsulation of reactive components with temperature-sensitive triggers, hybrid curing systems combining multiple triggers (e.g., heat and moisture)
- Tailored polymer chemistry for controlled reactivity and delayed curing, including controlled cross-linking density for predictable cure profiles
- Stabilizers and plasticizers to extend shelf-life, control viscosity, and prevent premature polymerization or degradation

Our must-have requirements are:

- Compatible with epoxy or melamine coating systems
- Lower the curing temperature by 20°C or more for high-temperature cure coatings, and/or achieve faster cure kinetics (50% reduction in dry-through time) for low-temperature cure systems like epoxy-amine, while using the same catalyst loading as current systems
- Maintain or improve pot-life (60 min to 2 hours for two-component systems) and/or shelf-life (6 months to 1 year for one-component systems)
- Reason to believe it can achieve regulatory approval

Our nice-to-have's are:

- Existing regulatory approval
- Cost-effective solutions
- Solutions that do not require further capital investment in curing equipment

What's out of scope:

- Coatings requiring curing temperatures above 200°C
- Known curing agents, such as commercially available catalysts from established chemical companies
- Solutions that negatively impact coating performance
- Catalysts that cause product discoloration (e.g., yellowing)
- Catalysts known to have regulatory concerns

Acceptable technology readiness levels (TRL): Levels 3-9
1. Basic principles observed
2. Concept development
3. Experimental proof of concept
4. Validated in lab conditions
5. Validated in relevant environment
6. Demonstrated in relevant environment
7. Regulatory approval
8. Product in production
9. Product in market

What we can offer you
Eligible partnership models:

- Sponsored research
- Co-development
- Supply/purchase
- Material transfer

Benefits:
Sponsored Research
Up to $100,000 for a proof-of-concept, with additional potential funding for further development.

Expertise
Partners will be connected to industrial coatings R&D scientists with expertise in coating chemistry and formulation, coating application and testing, catalysis, materials science, and analytical chemistry.

Tools and Technologies
Common instruments for materials science and analytical chemistry. Coating related tests can be conducted by the research team of the sponsor.

Facilities and Services
We can offer complimentary testing and proof-of-concept validation at our facilities.

Please contact the University of South Florida Technology Transfer office representative for submission – Roisin McNally at rmcnally@usf.edu