Catalyst for Synthetic Resin, Curing Agent and Coating

"Environmental protection without Tin", "oil to water" and "solvent-free" are the rapid development direction of coating industry (including PU resin synthesis and water-based PUD synthesis) . Aiming at the pain points and new trends of the industry, Guangzhou Yourun not only provides organic bismuth, zinc, zirconium, environmental protection tin and other catalysts for general purpose, but also introduces functional innovative environmental protection metal catalysts:

Conventional eco-friendly catalysts: organic bismuth BCAT series, organic zinc ZCAT series, eco-friendly tin series

Functional innovative eco-friendly catalysts: AUCAT series, U2, G5A, etc

Features of functional, innovative and environmentally friendly metal catalysts:

- Eco-friendly and not contain tin metal: environmental protection meets the domestic and foreign markets and complies with harsh international environmental protection regulations such as REACH, ROHS, OEKO-TEX Standard 100, etc.
- No inactivation in water: solve the technical problem that organic bismuth and organic tin are easy to hydrolyze and fail in water;
- Directly soluble in water-based resin without losing gloss: solve the problems of yellowing, viscosity increase and other storage instability caused by the addition of catalyst to isocyanate curing agent at present;
- High compatibility: solve the problem that the transparency of polyester resin decreases when used organic bismuth in UV curing.
- High catalytic activity: solve the high activity of the catalyst required for the synthesis of non yellowing PU resin (hydroxyl terminated) and the environmental protection of tin free.

1. Catalyst for Synthetic Resin

1.1 General Purpose Catalyst

High catalytic activity: solve the high activity of the catalyst required for the synthesis of non yellowing PU resin (hydroxyl terminated) and the environmental protection of tin free.

Eco-friendly tin catalyst: S02, WS8A, WP01A, etc, substitute for T-12

1.2 Special Functional Catalyst

Recommended Products：AUCAT-101、AUCAT-1301

As an eco-friendly substitute for organic tin, organic bismuth has many defects in the synthesis of polyurethane resin. The poor compatibility between organic bismuth and polyester polyol leads to turbidity and fog in the synthesis of polyester polyurethane resin, which affects the transparency of the resin, and then affects the transparency and gloss of the dry film of coating.

AUCAT series highly compatible catalysts can solve the above problems and have the following characteristics:

- It is highly compatible with polyester polyols and does not turn white;
- The oil-based PU resin and UV curing resin synthesized with it have good transparency and no fogging;
- The synthesized water-based PUD is more transparent;
- The dry film of resin has good transparency and high gloss.

Comparison of compatibility in UV resin
Experiment system: Polyester UV resin
Catalyst addition：1% with good compatibility

AUCAT-1301 is recommended for the synthesis of HDI polyester PU resin, which is an ideal substitute for organic tin. Its characteristics are as follows:

- 1) In the synthesis process, the viscosity increases quickly, the synthesis time is shortened, and the process stability is the same as that of organic tin. It solves the problems of low catalytic activity of organic bismuth, slow increase of viscosity or even failure of viscosity (slow increase of molecular mass or even failure to produce high molecular mass resin).
- 2) The catalytic activity is close to that of organic tin, more than 20 times higher than that of organic bismuth. The dosage is slightly higher than that of organic tin, but only one tenth of that of organic bismuth. In fact, even if the amount of organic bismuth is increased, the activity is still significantly insufficient.
- 3) The finished resin has good transparency and light color.

Attached table: Catalyst Selection Guide for Applications in Synthetic Resin

Application \ Model	AUCAT-101	AUCAT-1301	CUCAT-S02	BCAT Organic Bismuth	ZCAT Organic Zinc	WCAT-WS8A	WCAT-WP01A
Synthesis of oil-based PU resin	★★	★ (HDI Type)	☆	★★	★		
Synthesis of water-based PU resin	★★	★	☆	★★	☆		
Synthesis of PU modified UV resin	★★			★ (Polyether Type)			
Moisture curing PU resin						★★	★★

Meanings of Logo: ★★ — strongly recommended ★ — recommended ☆ — usable

This guide is only a rough directional guidance. The actual formula process is complex and diverse. The accurate suitability needs to be confirmed by test or communicated with Yourun engineer.

The above are only some of the products in application.

2. Catalyst for Curing Agent

2.1 Special targeted catalyst for the synthesis of water-based curing agent.

Recommended Products：CUCAT-U2

It is used for the synthesis of water-based curing agent. It can target and catalyze the grafting reaction of specific active hydrogen and isocyanate, and can improve the following characteristics of curing agent:

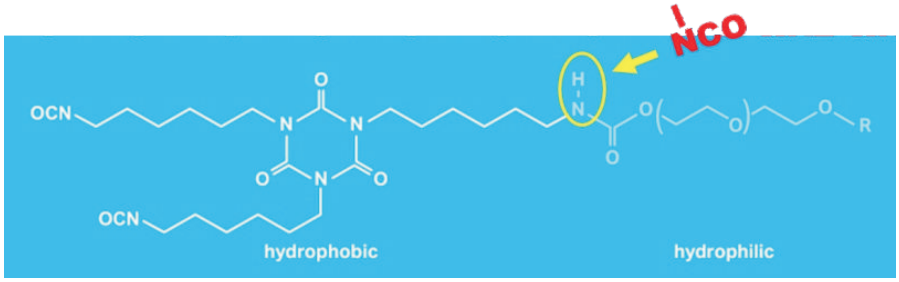
1) Low viscosity of curing agent: it only targets and catalyzes the formation of urea formate group and biuret group, and does not catalyze the side reactions such as the self polymerization of isocyanate, and solves the problems of unstable

2) Increase the functionality of the curing agent: it can significantly improve the water resistance, chemical resistance, scratch resistance, gloss, fullness and other characteristics of the paint film.

3) High film transparency. Based on the above targeted catalysis, the molecular structure of curing agent is branched.

4) Increase the NCO% of curing agent : graft monomer isocyanate.

5) Good water dispersibility: Based on the higher grafting rate of isocyanate monomer and hydrophilic monomer.



2.2 Special catalyst for synthesis of TDI Trimer curing agent (reducing free TDI)

Recommended products：CUCAT-G5A

- Reach the standard of environmental protection:
  significantly reduce the content of free TDI, and the single volume of free TDI can be reduced to less than 0.5%
- High catalytic activity: less addition and shorter reaction time
- Stable storage: neutralization and inactivation in the later stage of reaction, and the curing agent is white and transparent.

3. Polyurethane Coating

Polyurethane coatings include oil-based polyurethane coatings and water-based polyurethane coatings. The resins involved include polyether or polyester resin, hydroxypropyl resin, PUD, etc. The Yourun catalysts suitable for coatings are divided into conventional catalysts and functional innovative catalysts.

3.1 Recommended products of conventional catalyst:

Organic bismuth / zinc catalyst: BCAT-E20, ZCAT-EZ22 and so on, which are substitutes for imported products without difference.

Eco-friendly tin catalyst: CUCAT-HN6 and so on, which are substitutes for T-12.

3.2 Functional innovative catalysts:

Recommended Products：AUCAT-101、101W、101WA、201/201W

Solve the pain points and have the characteristics as follows:

For Oil-based coating:

solves the problem of deactivation of premixed catalyst. Oil-based coatings mostly use polar ester solvents with strong water absorption. The inevitable trace moisture leads to the gradual hydrolysis failure of organic bismuth and tin catalysts during storage, resulting in slow or even non curing of coatings. AUCAT series catalysts have the characteristic of anti hydrolysis without inactivation.

For Water-based coating:

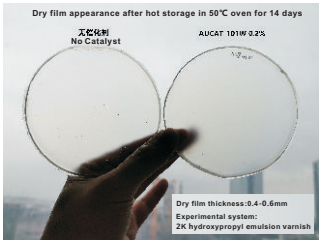
Solve the problems of deactivation and compatibility after adding catalyst. Due to the compatibility problem, traditional catalysts such as organic bismuth and organic tin cannot be added. The addition of organic amine catalysts will lead to problems in the coating such as yellowing during storage, bubbles and many pinholes during film formation.

Solve the problems of curing agent after adding catalyst. In order to improve the curing speed of paint film (especially in winter), the solution is usually to add catalyst to the curing agent component. Although it can solve the problem of hydrolysis failure of catalyst, it will lead to unstable storage and yellowing of curing agent. On the other hand, either organic bismuth or tin will affect the gloss of the paint film, especially for water-based coatings. AUCAT series catalyst does not need to be added into curing agent.

The catalysts have the excellent characteristics in experiment

The hot storage is stable, and the activity doesn't attenuate or fail.

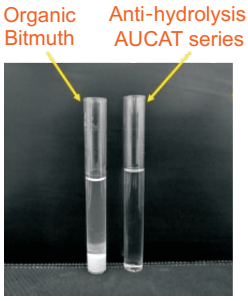
store in oven of 50℃ for 14 days
no hydrolytic precipitation



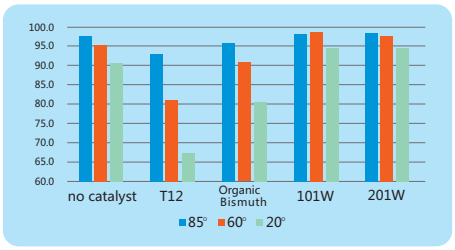
No change in dry film transparency

Excellent anti-hydrolysis and compability

Comparison of compatibility in UV resin
Experiment system: Polyester UV resin

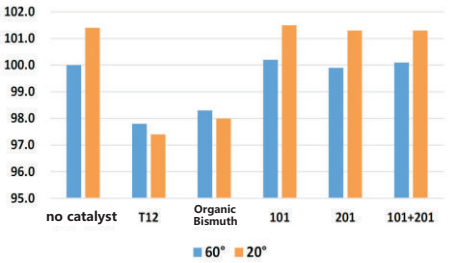


Good compatibility, the film gloss does not decrease



The test results comparing the effects of different catalysts on the gloss of water-based high gloss hydroxypropyl coating are shown in the left figure

- AUCAT-101W/201W have no effect on the gloss of paint film ;
- Organic bismuth and T12 cause obvious fog on paint film.
- AUCAT-101W/201W has good compatibility with most waterl-based hydroxyl acrylic resins, PUD and water-based curing agent. It does not affect the gloss of the paint film.



The test results comparing the effects of different catalysts on the gloss of oil-based high gloss hydroxypropyl coating are shown in the left figure.

- AUCAT-101/201 have no effect on the gloss of paint film ;
- Organic bismuth and T12 cause obvious fog on paint film.
- AUCAT-101/201 has good compatibility with most oil-based hydroxyl acrylic resins, polyether or polyester polyols and isocyanate curing agents. It does not affect the gloss of the paint film.

Attached table: Catalyst Selection Guide for applications in polyurethane coating

Application \ Model		AUCAT-101	AUCAT-201	AUCAT-301	AUCAT-101W	AUCAT-201W	AUCAT-301W	CUCAT-HN6	BCAT Bismuth	ZCAT Zinc
Oil-based	2K PU Coating	★★	★★					★	★	★
	PU Baking Paint	★★	★★	★				★	★	★
Water-based	2K PU Coating				★★	★★				
	PU Baking Paint				★★	★★	★			

Meaning of Logo : ★★ —— Strongly Recommended ★ —— Recommended ☆ —— Usable

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4. Water-based Alkyd Coating

Catalyst Models:

Model	Category	Appearance	Compatibility	Property	Application
ALCAT-CS04	Auxiliary catalyst	Yellowish transparent liquid	Partially water-soluble	It has good compatibility with water-based / oil-based alkyd resin. When used in combination with main catalyst, it can accelerate the oxidation cross-linking and film formation of the coating and curing faster; CS04 and CS05 can be used alone or in combination.	Water-based and oil-based alkyd coating
ALCAT-CS05					
ALCAT-CS07A	Main catalyst	Nanoparticle dispersion	Fully water-soluble	It has good compatibility with water-based alkyd resin, accelerates the surface and internal curing of paint film, has good color retention, and can recover quickly after soaking in water.	Water-based alkyd coating
ALCAT-CS10A			Partially water-soluble	It can be added to water emulsified resin with good compatibility and no oil slick, stratification and precipitation; The paint film dries fast and can recover quickly after soaking in water.	

Unique Performance

The hydration demand of alkyd coatings is developing rapidly. ALCAT series alkyd coating catalyst are developed according to the curing characteristics and environmental protection requirements of water-based alkyd coatings. They are used in water-based alkyd coatings and have the following characteristics:

1. It is used in water-based air drying alkyd coatings, with fast surface and internal curing.
2. It has good compatibility with water-based alkyd resin, good transparency of paint film and no whitening.
3. The paint film can quickly restore transparency after soaking in water.
4. It can be added to water emulsified resin with good compatibility and no oil slick, stratification and precipitation.
5. The main catalyst can be used alone or in combination with the auxiliary catalyst to accelerate the oxidation and cross-linking of the coating and form a film, so as to curing faster.

Scraping the film for 24 hours
Soak it in water at room temperature for 24 hours
take it out and place it for 2 hours

Attached table: Product Selection Guide for applications in PU coating / synthetic resin

1. Hydrolysis resistant catalyst
（can be stably stored in aqueous components for a long time without deactivation）

Model	Eco-friendly	Compatibility	Targeting and Catalyzing	Catalytic Activity	Property	Application
AUCAT-101 AUCAT-201	It meets the requirements of restricted components of toy paint, such as heavy metals, azo, phthalates, etc.	Lipophilic, highly compatible with hydroxyl acrylic resin, polyester resin and polyether resin	It has high catalytic targeting for the reaction of isocyanate and hydroxyl	High ~Mild	101 can significantly accelerate the curing of paint film. Good compatibility, the paint film does not lose gloss; Improve the abrasion resistance and scratch resistance of paint film; Stable storage in aqueous polar solvent, no hydrolysis failure, fast curing at low temperature. For PUD synthesis, the emulsion transparency can be improved, and the film-forming glossiness is high; 201 has a long pot life and promotes the crosslinking and curing of the paint film. It can collocate with 101 to adjust the pot life and the drying speed of the paint film.	2K oil-based polyurethane coating, hydroxypropyl coating, closed isocyanate baking paint, PU resin synthesis, PUD synthesis, etc
AUCAT-101W AUCAT-201W		Hydrophilic, easy to emulsify, disperse and compatible in water based coatings		High ~Mild	It can be added to water-based emulsion / coating components, the activity is stable and not failure during storage, the paint film does not lose gloss, fast curing at low temperature; It can avoid yellowing, thickening and gelatinization when the catalyst is added into the curing agent; 101W has high catalytic activity, 201W can promote crosslinking reaction and improve hydrolysis and chemical resistance; The combination of the two can adjust the pot life and the drying speed of the paint film.	2K Waterborne Polyurethane coating, waterborne hydroxypropyl coating, waterborne closed isocyanate baking paint, etc
AUCAT-RM301 AUCAT-RM301W		Good compatibility with various resins, 301 is lipophilic, 301W is hydrophilic		High	Thermal sensitive catalyst, it has no catalytic activity at room temperature. When the temperature rises to the thermal point (about 70 ℃), the catalytic activity increases geometrically and the film is formed rapidly. 301W can be added into waterborne emulsion / paint for stable storage without failure.	Oil-based and water-based closed isocyanate baking paint.
AUCAT-106		Highly compatible with polyester, polycaprolactone, polycarbonate, polyether and other polyols, hydroxyethyl acrylate, etc		Moderate	Catalyze the synthesis of UV curing resin without side reaction, good transparency and stable storage.	the synthesis of UV curing resin
AUCAT-130 1				High	It has significant thermal activity, moderate catalytic activity at room temperature, and geometric growth of catalytic activity at elevated temperature.	Synthesis of low activity aliphatic PU resin
ZCAT series of Organic Zinc			Good synergy, used as cocatalyst	Mild	General purpose organic zinc catalyst; metal content: 16-22%	

2. Conventional catalyst（non hydrolytic type）

Model	Eco-friendly	Compatibility	Targeting and Catalyzing	Catalytic Activity	Property	Application
CUCAT-HN6	Eco-friendly tin catalysts, in compliance with REACH / ROSH regulations.	Lipophilic type, good compatibility with various resins	It has high catalytic targeting for the reaction of isocyanate and hydroxyl	High	It is not sensitive to trace moisture and reduces pitting and pinholes on the surface of the paint film.	2K oil-based polyurethane, hydroxypropyl coating, closed isocyanate baking paint
CUCAT-S02				High	Long pot life, fast post curing, rapid film forming.	Solvent free leather coating and PU resin synthesis
WCAT-WS8A/WP01A			Catalyze the reaction of isocyanate with water	High	High catalytic activity at low temperature, fast surface drying, and rapid film formation in winter construction.	Wet curing resin, wet curing coating
CUCAT-U2	It meets the requirements of restricted components of toy paint, such as heavy metals, azo, phthalates, etc.	Lipophilic, good compatibility with curing agent.	targeting and catalyzing the formation of urea formate group and biuret group	Moderate	A special catalyst for the synthesis of waterborne isocyanate curing agent, which targets and catalyzes the grafting reaction of specific active hydrogen and isocyanate to increase the functionality of curing agent. It can significantly improve the water resistance, chemical resistance, scratch resistance, gloss, fullness and other characteristics of the paint film.	Synthesis of waterborne isocyanate curing agent, special Pu and PUD resin
CUCAT-G5A			Catalyze isocyanate self polymerization	Moderate	Trimerization catalyst, it can significantly reduce the content of free TDI when used to synthesize TDI curing agent.	Synthesis of TDI curing agent.
BCAT series of Organic Bismuth		Lipophilic, with good compatibility with most resins	Catalyze the reaction of isocyanate with hydroxyl	High	General purpose organic bismuth catalyst; metal content: 16-28%	2K oil-based polyurethane, hydroxypropyl coating, closed isocyanate baking paint, oil-based PU resin synthesis, PUD synthesis
ZCAT series of Organic Zinc			Good synergy, used as cocatalyst	Mild	General purpose organic zinc catalyst; metal content: 16-22%	

3. Other functional additives（for non-aqueous systems）

Product Name	Model	Appearance	Product Property
Defoamer	YRXP-02	Transparent liquid	Non silicon efficient defoamer with good compatibility and transparency.
	YRXP-06	Translucent liquid	Organic silicone efficient defoamer wigh good foam inhibition and breaking effect, it can quickly eliminate micro bubbles and large bubbles.
Antistatic Agent	CUCE-W	Transparent liquid	Excellent antistatic effect, less addition, light color, does not affect the appearance of the coating.
Anti-yellowing Antioxidant	UVK-CL2	Yellowish transparent liquid	Good compatibility, migration resistance, UV resistance, yellowing resistance, high efficiency and less addition; The color is light and does not affect the appearance chroma.
Anti-settle Dispersing Agent	YRFC-03	Transparent liquid	Non ionic neutral, it can disperse a large number of powder particles absorbing on the surface by only adding a small amount, and effectively reduce the adsorption between powder particles, prevent powder sedimentation, hardening and color change, and improve the anti sagging property. The function is similar to BYK-410.
Viscosity Reducer	YRFC-06A	Brown transparent liquid	High efficiency dispersion agent and viscosity reducer, excellent powder dispersion, significantly reduce system viscosity, improve leveling, and reduce paint film defects such as brush marks, peeling and pinholes.