

STABiO™

**Bio-based aliphatic polyisocyanate
and its hardener
for coating and adhesive**

**Coating & Engineering Materials Div.,
Polyurethane Business Sector
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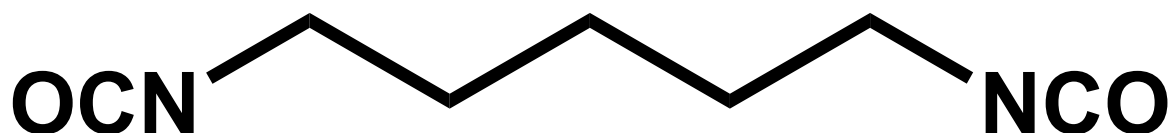
1. Concept of STABio™



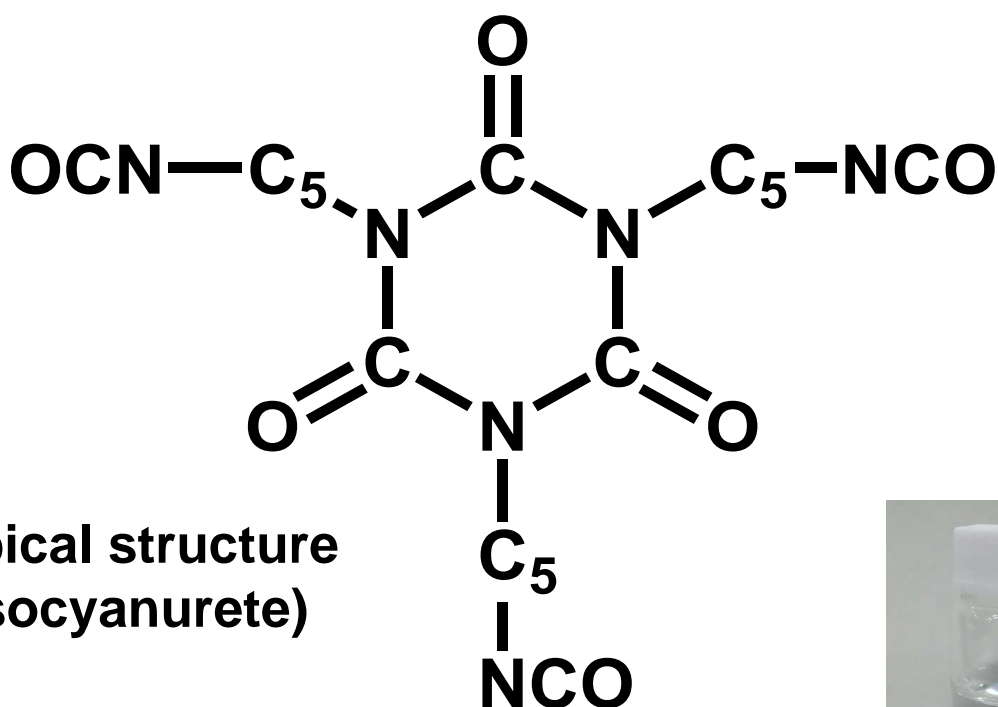
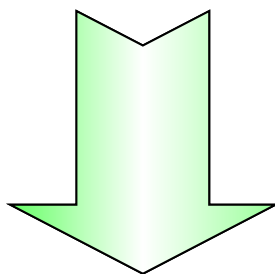
High performance bio-based aliphatic polyisocyanate for polyurethane(PU) coating and adhesive

Features	Benefits -> Improve point	Compare with HDI
High Reactivity	<ul style="list-style-type: none"> - Short curing period - Low drying temperature <ul style="list-style-type: none"> -> CO2 emission -> Environmental load -> Production cost 	ca.1.5-2 times high reactivity
High Isocyanate Content (NCO%)	<ul style="list-style-type: none"> - High performance PU <ul style="list-style-type: none"> -> Chemical resistance -> Abrasion resistance - Decrease hardener amount <ul style="list-style-type: none"> -> Weather resistance 	ca.1.2 times Solvent Resistance ca.10% low amount
Low Viscosity	<ul style="list-style-type: none"> - High solid content <ul style="list-style-type: none"> -> Environmental load - Superior smoothness <ul style="list-style-type: none"> -> Appearance of coating film 	ca.20% low viscosity
Aliphatic non-symmetric structure	<ul style="list-style-type: none"> - High transparency - Good weather resistance <ul style="list-style-type: none"> -> Appearance of coating film 	High
Biomass	- Sustainable development	70% vs 0%

2. Polyisocyanate and Hardener



**Pentane-1,5-diisocyanate
(STABiO™ PDI™)**



Typical structure
(Isocyanurete)

STABiO™ Hardener

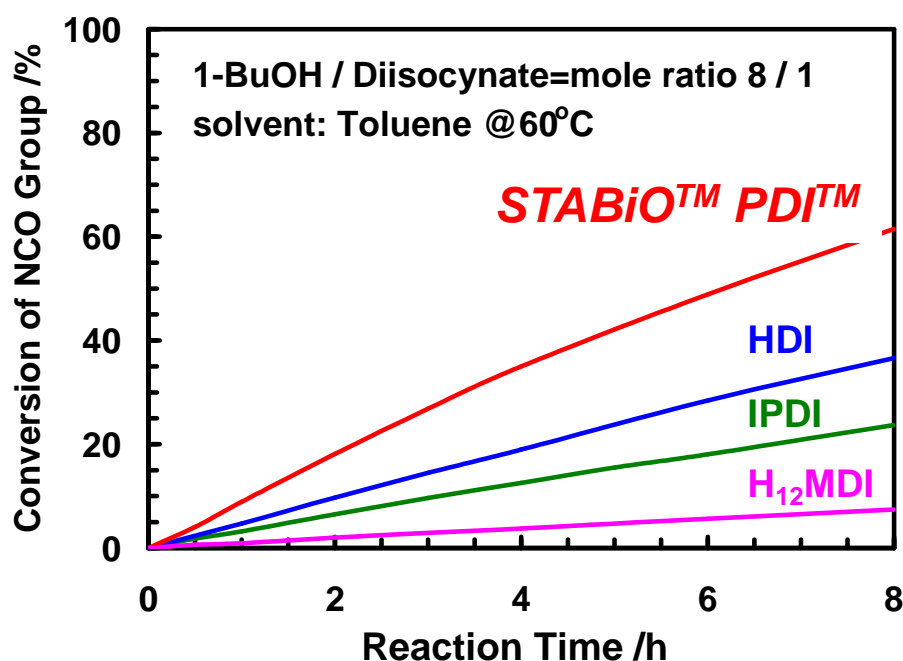


3. Advantage of STABiO™ PDI™



Features of STABiO™ PDI™

**High
Reactivity**



**High
NCO %**

54.5

**High
biomass%**

71 ¹⁾

1)Measured by ASTM D6866

CONFIDENTIAL-MCI Proprietary Information

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4. STABiO™ Harndener



4-1. Characteristics

High NCO% and Low viscosity with High biomass%.

	PDI based		HDI based
	STABiO™ D-370N	STABiO™ D-376N	TAKENATE™ D-170N
Solid %	100	100	100
NCO%	25	24	21
Viscosity mPa.s/25°C	2,000	900	2,600
Biomass%	70	67	0

4-2. Polyurethane properties

Superior chemical/solvent resistance and high hardness at small amount of hardener.

		PDI based		HDI based
		STABiO™ D-370N	STABiO™ D-376N	TAKENATE™ D-170N
Polyol/Hardener(w/w) Reduction ratio over HDI		69/31 11%	69/31 8%	66/34
Hardness	Pencil Hardness	HB	B	B
Chemical Resistance	Methanol Rubbing /times to break	1200	1000	1000

Polyol : Acryl base OHV 150mgKOH/g $T_g=30^{\circ}\text{C}$, NV=50% Index:[NCO]/[OH]=1.0

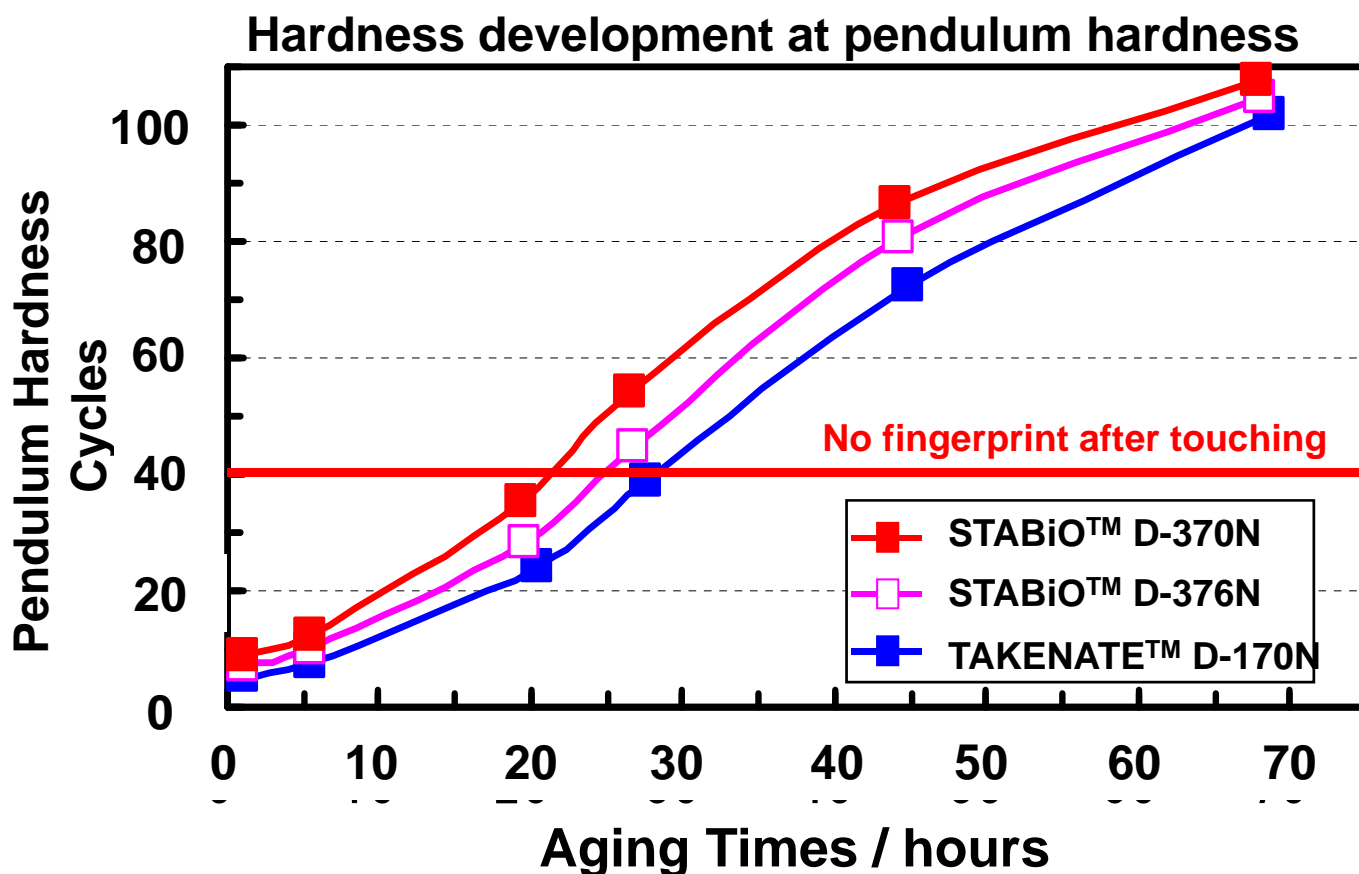
Cure: 60°C-30min + 7days at 23°C50%RH

4-3. Curing properties of PU coating

- Good hardness development at same potlife with HDI system
- Shorter the aging time by 25% than HDI based system

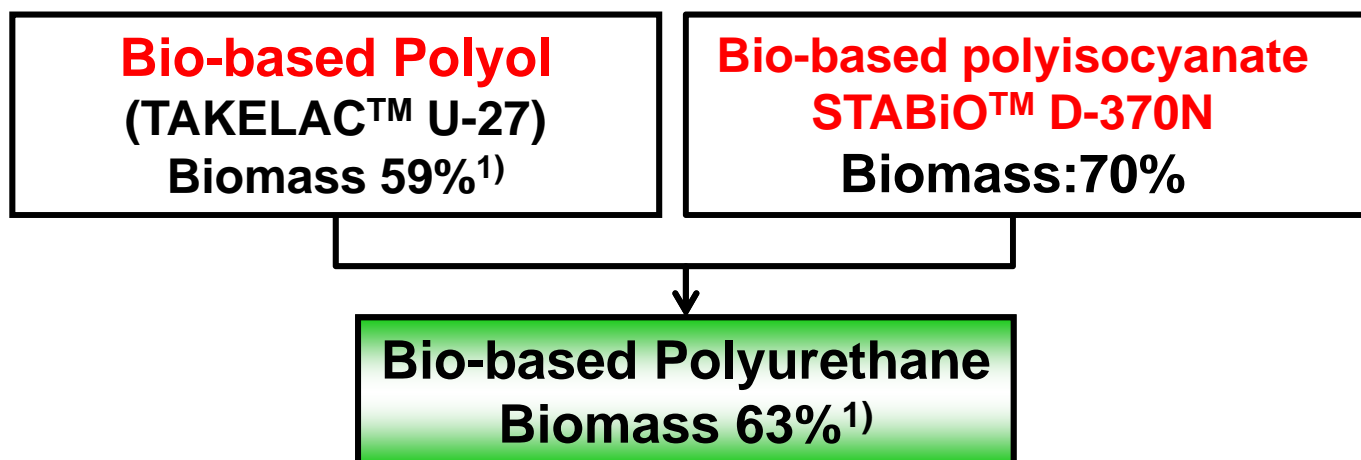
	STABio™ D-370N	STABio™ D-376N	HDI based TAKENATE™ D-170N
Workable time ¹⁾	21hr	25hr	28hr

Aging time at 40cycles pendulum hardness , which remains no fingerprint after touching.



Acrylic Polyol, non-styrene type OLESTER™ (NV=50, OHV=150mgKOH/g, $T_g=30^\circ\text{C}$)
 Index:[NCO]/[OH]=1.0 Test plate: Steel (JIS-G3141)
 Catalyst: DBTDL add to 6 hours pot life at room temperature
 Film thickness: 40μm, Baking : 60°C30min Aging: 23°C50%R.H.
 Measurement: Pendulum Damping test, Koenig type

5. Properties of Bio-based Polyurethane



1)ASTM D6866 Method-B, 2)Butyl acetate

Item	Method		Film Property
Hardness	Pencil hardness glass plate	JIS K 5600	2B
	Martens hardness Steel Plate	ISO 14577	36 N/mm ²
Flexural Durability	Cylindrical Mandrel Diameter 2mm, Tin Plate	JIS K 5600	Good
DuPont Impact	Steel Plate	JIS K 5600	1000g 1/5inch 20cm
Flexibility	Erichsen test Steel Plate	JIS K 5600	8.7 mm
Solvent Resistance	Rubbing Times to break Glass plate	Ethyl acetate	670
		Toluene	>1000
		MEK	300
Adhesion	Cross Cutting Steel Plate	JIS K 5600	100 /100

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