

UNICELL-D Series

Description

UNICELL-D series is well known as one of the most widely used and effective foaming agents for plastics and rubbers, such as PVC, PP, PE, EVA, ABS, PS, EPDM, SBR, NBR, and TPR.

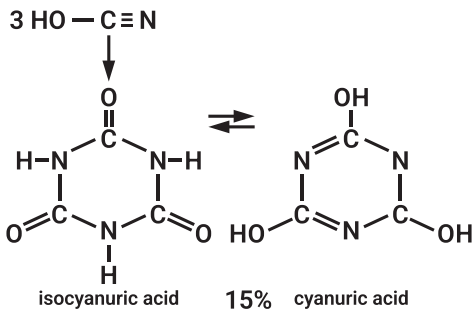
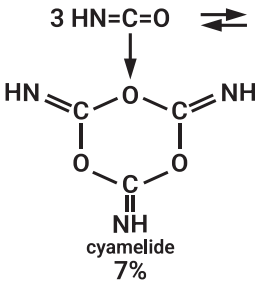
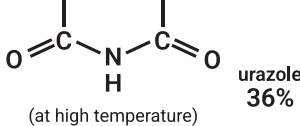
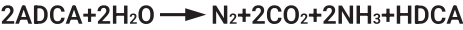
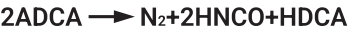
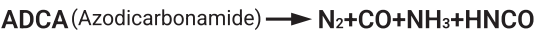
UNICELL-D series can be tailored to use with rubbers and plastics through the addition of activators.

UNICELL-D has a relatively high decomposition temperature and evolves a large volume of gas.

Therefore, it offers improved safety compared to other colorless foaming agents and produces uniform white microcellular structures.

Decomposition of UNICELL-D series

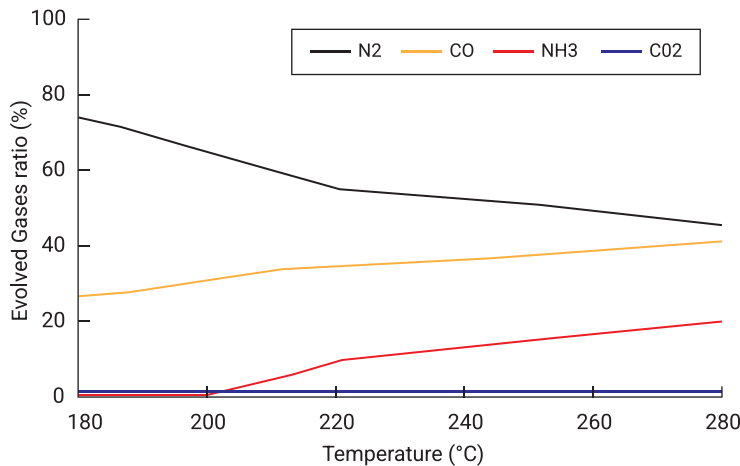
The decomposition mechanism of UNICELL-D series (ADCA) varies depending on the heating range and processing conditions.



Through these reactions, UNICELL-D series decomposes and generates several types of gases, as follows.

Table 1. The volume ratio of evolved gases depending on temperature and the ratio of gases & residues after decomposition.

Gas		Temp	181~198	210~220	250~280
Evolved gas volume (ml/g)			185~218	263~322	355~454
Residue after decomposition (%)			72.5~76.7	61.3~68.0	46.9~56.5
Gaseous product after decomposition (%)			23.3~27.5	32.0~38.7	43.5~53.1
Evolved Gas	N ₂ (%)		70.8~72.9	53.9~58.8	42.6~48.9
	CO (%)		26.0~26.5	32.9~33.1	36.2~40.8
	NH ₃ (%)		0~0.9	7.4~12.0	8.2~19.1
	CO ₂ (%)		1.0~1.8	0.7~1.2	2.1~2.2



*Azodicarbonamide (Azobisformamide)

*General purpose foaming agents

UNICELL-D Series

Properties of UNICELL-D series

Table 2. The physical properties of UNICELL-D series.

Item		Specification							
Grade Name		D200A	D300	D400	D600	D800	D900	D1100	D1500
Chemical Name		Azodicarbonamide (Azobisformamide)							
Appearance		Fine Yellow Powder							
Decomposition Temperature (°C)		202~208							
Gas Volume (ml/g)		225~250							
Average Particle Size (μm)	Laser	4.8~5.8	5.6~6.1	6.2~7.2	8.2~9.0	10.8~11.8	12.0~13.0	14.0~15.0	19.0~21.0
	Fisher	2.5~2.8	2.6~2.9	3.6~3.9	5.7~6.1	7.6~8.0	8.0~8.3	9.6~10.0	14.0~17.0
Moisture Content (%)		0.3 max.							
Molecular Weight		116.08							
Specific Gravity (g/cm³ at 25 °C)		1.65							
Specific Heat		0.26							
Decomposition Heat (kcal/mole)		10							
Solubility (g sample/100ml solvent)						in water	0.020		
						DMSO	4.300		
						MEK	0.015		
						Acetone	0.016		
						DMF	5.000		
						Toluene	0.012		
						Benzene	0.014		
CAS No.		123 - 77 -3							

Particle size of UNICELL-D series

Particle size is a significant factor in determining the decomposition speed of UNICELL-D series.

As the particle diameter decreases, the surface area increases. Thus, heat transfer to UNICELL-D series is more effective and faster, influencing the decomposition speed of UNICELL-D series.

The particle size is selected to optimize the balance between the curing and decomposition speed of UNICELL-D series.

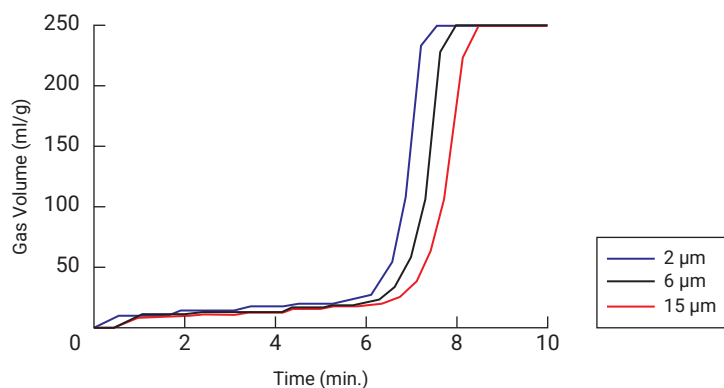


Fig 2. The decomposition behavior of UNICELL-D series at the constant temperature of 200 °C.

UNICELL-D Series

Activation (Activator, Kicker)

There are many types of activators for **UNICELL-D** series, but they must be carefully selected based on factors such as compatibility and the risk of undesirable chemical reactions.

UNICELL-D series offers a wide range of applications due to easy control of the decomposition temperature using its activators.

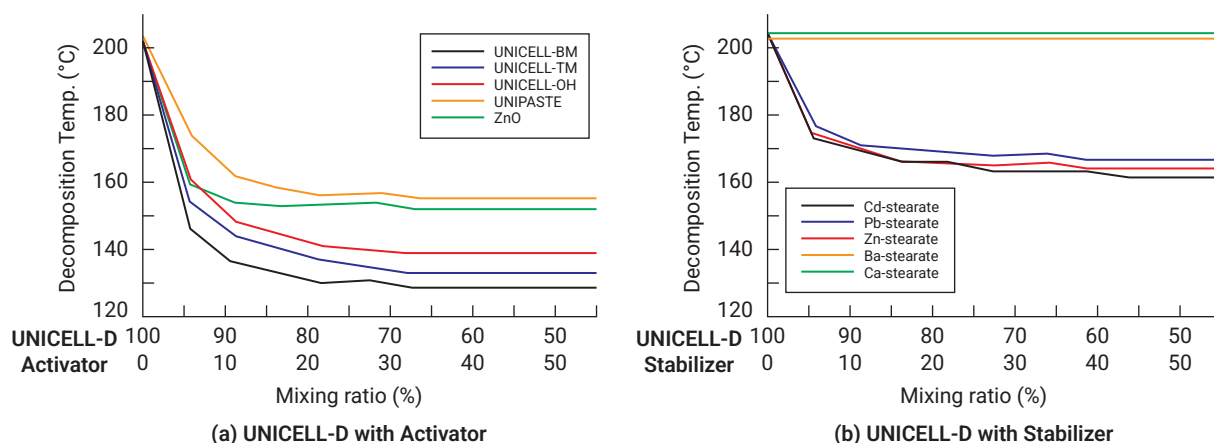


Fig 3. The decomposition temperature of **UNICELL-D** mixture ; (a) with activators ; (b) with metallic stabilizers

Table 3. The activators for **UNICELL-D** series and the change of their decomposition temperatures
(UNICELL-D : Activator = 1 : 1)

Cadmium Compounds		Strontium naphthenate	153~180	Acetic	140~195
Cadmium oxide	140~184	Strontium zinc laurate	150~180	Citric	145~165
Cadmium perborate	141~165	Magnesium Compounds		Succinic	155~190
Cadmium 2-ethylhexoate	115~160	Magnesium oxide	165~200	Salicylic	165~200
Cadmium acetoacetate	157~205	Lead Compounds		Acetyl salicylic	165~200
Cadmium dodecylmercaptide	130~180	Lead acetate	127~180	Sulfamic	160~205
Zinc Compounds		Lead oxide	151~180	Loralkyl phosphoric	155~195
Zinc chloride	80~135	Lead sulfate	160~185	Maleic anhydride & water	100~180
Zinc acetate	100~105	Dibasic lead phosphite	145~160	Phosphoric	90~160
Zinc nitrate	105~140	Tin Compounds		Butyl phosphoric	130~170
Zinc laurate	150~180	Tin methoxy maleate	140~185	Malic	155~185
Zinc oxide	130~155	Dibutyl tin maleate	150~186	Bases	
Zinc octoate	155~190	Stannous oxide	160~210	Guanidine carbonate	135~180
Zinc carbonate	150~170	Silicon Compounds		Potassium carbonate & water	100~145
Zinc stearate	150~155	Superex clay	140~200	Potassium carbonate anhydrous	155~210
Zinc propionate	158~185	Silene	135~200	Borax	100~185
Zinc dust	155~175	Superfiltrol	120~165	Ethanolamine	85~100
Barium Compounds		Dixie clay	145~200	Miscellaneous	
Barium ricinolate	145~180	Hi Sil	155~201	Dimethyl formamide	135~160
Barium stearate	162~210	Acids		Cupric stearate	145~195
Calcium Compounds		Oxalic	100~150	Aluminium stearate	160~190
Calcium carbonate	155~200	p-Toluene sulfonic	100~180	Titanium oxide	160~195
Calcium stearate	150~175	Glycollic	110~150	Boron trifluoride	120~160
Strontium Compounds		Lactic	115~150		