- Azodicarbonamide (Azobisformamide)
- General purpose foaming agents

## **D**escription

■ UNICELL-D series are well known as 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 are modified to be adoptable to almost all of the rubbers and plastics by additives like activators. UNICELL-D series are non-toxic and self-extinguishing materials and have relatively high decomposition temperature and release a large volume of gases. Therefore, they can be used more safely than any other colorless foaming agents and they can produce a white, micro-cellular structures.

## Decomposition of UNICELL-D series

Decomposition mechanism of **UNICELL-D** series (ADCA) is complex and changes depending upon the heating range and the environment of the decomposition.

ADCA(Azodicarbonamide) 
$$\longrightarrow$$
 N2+CO+NH3+HNCO 2ADCA  $\longrightarrow$  N2+2HNCO+HDCA 2ADCA+2H2O  $\longrightarrow$  N2+2CO2+2NH3+HDCA HDCA  $\longrightarrow$  HN  $\longrightarrow$  HN+NH3  $\longrightarrow$  HN  $\longrightarrow$  C  $\longrightarrow$  N2+2CO2+2NH3+HDCA  $\longrightarrow$  HN  $\longrightarrow$  HN  $\longrightarrow$  HN  $\longrightarrow$  HN  $\longrightarrow$  HN  $\longrightarrow$  N2+2CO2+2NH3+HDCA  $\longrightarrow$  HN  $\longrightarrow$  N2+2CO2+2NH3+HDCA  $\longrightarrow$  HN  $\longrightarrow$  O  $\longrightarrow$  N2+2CO2+2NH3+HDCA  $\longrightarrow$  HN  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  NH  $\longrightarrow$  O  $\longrightarrow$  NH  $\longrightarrow$ 

By these reactions, UNICELL-D series is decomposed and evolves several kinds of gases as below.

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

Gas	Temp	181~198	210~220	250~280		
Evolv	ed 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 pro	duct after decomposition (%)	23.3~27.5	32.0~38.7	43.5~53.1		
Evolved Gases	N2 (%)	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 <sub>3</sub> (%)	0~0.9	7.4~12.0	8.2~19.1		
	CO <sub>2</sub> (%)	1.0~1.8	0.7~1.2	2.1~2.2		

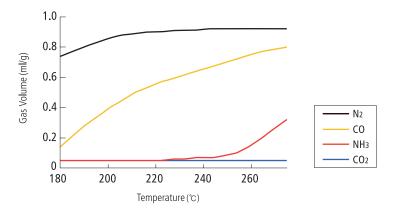


Fig 1. The change of gas components depending on temperature

## Properties of UNICELL-D series

Table 2. The physical Properties of UNICELL-D series

ltem	Specification														
Grade Name	D200	D200L	D200M	D300	D300L	D300M	D330	D400	D600	D800	D900	D1100	D1300	D1500	D2500
Chemical Name	Azodicarbonamide (Azobisformamide)														
Appearance	Fine Yellow Powder														
Decomposition Temperature (°C)		202~208													
Gas Volume (ml/gr)	225~250														
Average Particle Size (µm)	1.8~2.1	1.8~2.1	2.3~2.7	2.6~2.9	2.6~2.9	2.6~3.0	2.7~3.0	3.6~3.9	5.7~6.1	7.6~8.0	8.0~8.3	9.6~10.0	12.6~13.0	14.0~17.0	24.0~26.0
Moisture Content (%)	0.3 max.														
Chemical Formula	$H_2N - CO - N = N - CO - NH_2$														
Molecular Weight	116.08														
Specific Gravity $(g/cm^3 \text{ at } 25 ^{\circ}\text{C})$	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 rate of decomposition of UNICELL-D series.

As the particle diameter decreases, the surface area is increase. Thus the heat transfer to the UNICELL-D series is more effective and faster, and this influences on decomposition rate of UNICELL-D series.

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

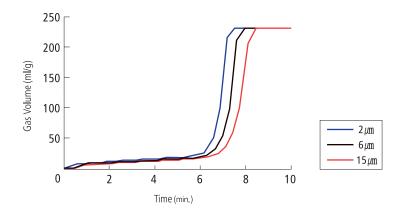


Fig 2. The decomposition behavior of UNICELL-D series at the constant temperature of 200  $^{\circ}\!\mathrm{C}$