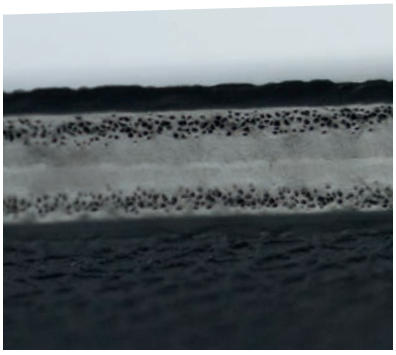
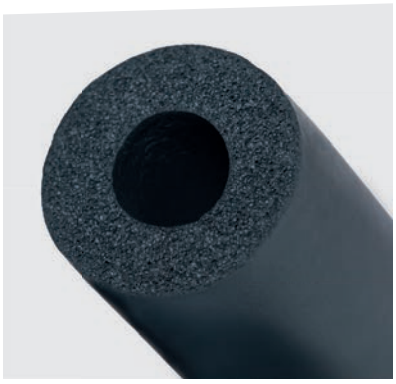
LUVOBATCH®

Customized masterbatches

Blowing Agent Masterbatches

Plastics Made Light





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Sustainability by Plastic Reduction

LUVOBATCH® Blowing Agents Make More out of Your Plastics

Chemical blowing agents are used in a wide range of applications to achieve various positive effects. Being reactive additives, they release gases in a thermal decomposition reaction during the processing of thermoplastics. These enable the production of a stable plastic foam.

Chemical blowing agents are generally classified as either endothermic or exothermic systems, each of which follow different decomposition reactions and have different properties.

This brochure gives you a brief insight into our wide range of possibilities.
We welcome you to discuss with us personally, which solution is best for your application.

Typical chemical blowing agents are:

- **Endothermic:** Carbonates, mixtures with carbonates, citrates
- **Exothermic:** ADCA, OBSH, TSH

We supply our LUVOBATCH® products in various forms:

- **Powder:** Low dosage, no foreign carrier, (safety precautions may be necessary due to dusting)
- **Masterbatch (standard and micro granules):** Dust-free, safe dosage, good dispersion

If density reduction is the goal, the use of chemical foaming agents is a promising option. By foaming the plastic, weight reduction is achieved and costs are saved. In addition to this, improved product properties such as the reduction of sink marks and dimensional stability are achieved. These are only a few of the advantages that can be accomplished through the use of chemical foaming agents.

- Improved thermal and sound insulation
- Improved dielectric properties
- Improved shock absorbing properties
- Avoidance of sink marks in injection molding
- Decorative effects
- Reduction of cycle time through reduction of melt viscosity

The products mentioned in this brochure reflect only a fraction of our portfolio.
We specialize in products according to your requirements.

Application of LUVOBATCH® Blowing Agents

LUVOBATCH® Masterbatches	PE	PP	PA	EVA	PET	PS	PVC	Others	Extrusion (E) / Injection molding (I)
Endothermic systems									
UC BA 1006	●	●		●		●		●	E+I
PE BA 5139	●	●		●					E+I
PE BA 5137	●	●		●		●			E+I
PE BA 9537	●	●		●	●	●		●	E+I
PE BA 9538	●	●		●		●		●	E+I
PE BA 9674	●	●		●		●		●	E+I
PE BA 5821	●	●		●	●	●		●	E+I
PE BA 5823	●	●		●		●		●	E+I
EA BA 5350	●	●		●	●	●	●	●	E+I
PP BA 5390		●							E+I
PA BA 1001/1002			●						I
UC BA 5546	●	●		●	●	●		●	E+I
Exothermic systems									
EV BA 5391-01				●			●		E
EV BA 5332				●			●		E
UC BA 1059	●	●	●	●		●		●	E+I
UC BA 1065	●	●	●	●		●		●	E+I
PE BA 9978	●	●		●				●	E+I
PE BA 7038	●	●		●				●	E+I
PP BA 5373		●							E+I
EV BA 5335	●	●		●			●		E+I
EV BA 9525	●	●		●			●		E
EV BA 9994	●	●		●			●		E+I

Blowing Agents

Application of LUVOBATCH® Blowing Agents

LUVOBATCH® Masterbatches	PE	PP	PA	EVA	PET	PS	PVC	Others	Extrusion (E) / Injection molding (I)
Endothermic / exothermic combinations									
EV BA 9341				●			●		E+I
EV BA 9551				●			●		E+I
EV BA 5348				●			●		E+I
EA BA 9647 - TR				●			●		E+I
Nucleating agents									
PE AB 9882	●	●		●		●		●	E+I
PA NUK 9642-00			●						E+I
Powder products									
PW BA 9510	●	●		●				●	E
PW BA 9507	●	●		●				●	E
PW BA 9509	●	●		●				●	E
PW BA 1417							●	●	E
PW BA 0134							●	●	E
LUVOPOR ABF10	●	●		●		●	●	●	E
LUVOPOR ABF70	●	●		●		●	●	●	E
LUVOPOR OB-Pulver	●	●					●	●	E+I*
PW BA 9534	●	●		●		●		●	E
PW NUK 1143	●	●		●		●		●	E
PW BA 1141	●	●		●		●		●	E
PW BA 1092	●	●		●		●		●	E
PW BA 9341	●	●		●		●	●	●	E

* = rotational molding

Endothermic LUVOBATCH® blowing agents for a controlled reaction

When heat is applied, chemical blowing agents decompose and produce non-reactive gases such as carbon dioxide and water vapour. The best known agents are carbonates and carboxylic acids. Since heat is consumed for the initiation and continuation of the reaction, they are referred to as endothermic blowing agents. Their advantage lies in the fact that the gas evolution can be controlled by regulating the heat flow. For example, the heat supply can be throttled until the gas formation stops and can be restarted with a renewed heat supply.

Characteristics of endothermic LUVOBATCH® blowing agents:

- Gas yield approx. 100 – 140 ml/g
- Higher dosing quantities compared to exothermic TMs
- Controlled foaming process
- Very fine cell structure
- Shorter cycle times
- Reduction of streaking
- Avoidance of post-inflation
- Approved for food packaging
- Processing temperature approx. 10 °C higher than decomposition temperature

Overview of endothermic systems:

LUVOBATCH® Masterbatches	Form		Decomposition temperature [°C]	Gas yield [ml/g]	Indicative dosage [%]	Application in						
	Granules	Microgranulate				Cast film	Blown film	Pipe extrusion	Cable extrusion	Sheet extrusion	TSG + sink marks	NUC
UC BA 1006	●		170	30	0,1 – 3	●	●	●	●	●	●	
PE BA 5139	●		120	8	0,5 – 4	●	●				●	●
PE BA 5137	●		130	10	0,5 – 4	●	●				●	●
PE BA 9537	●	●	140	20	0,2 – 4	●	●	●	●	●	●	●
PE BA 9538	●		135	45	0,2 – 1	●	●	●		●	●	
PE BA 9674	●	●	125	100	0,1 – 3	●	●	●		●	●	
PE BA 5821	●		200	60	0,5 – 15	●	●	●		●	●	
PE BA 5823	●		200	30	0,1 – 4	●	●	●		●	●	●
EA BA 5350	●		200	45	0,5 – 4	●	●			●	●	
PP BA 5390	●		210	30	0,5 – 4	●	●	●	●	●	●	
PA BA 1001/1002	●		n. d., Processing temperature > 280 °C		0,5 – 8						●	
UC BA 5546	●		200	40	0,5 – 4	●	●			●	●	

Exothermic LUVOBATCH® blowing agent for high gas pressure

The decomposition of exothermic blowing agents is started by irradiation, heat or other forms of energy and can no longer be interrupted. Heat and gases such as nitrogen, carbon dioxide or ammonia are released within a short time. The most commonly used agents are azodicarbonamide and sulfonylhydrazide. In foaming, they are characterized by their high effectiveness, a higher gas pressure and good foaming results.

Characteristics of exothermic LUVOBATCH® blowing agents:

- Gas yield approx. 220 ml/g for azodicarbonamide
- Low dosing quantities (see comparison with endothermic)
- Constant gas distribution
- NOT approved for food packaging
- Higher weight reduction possible
- Processing temperature approx. 20 °C higher than decomposition temperature (may vary depending on processing conditions)

Overview of exothermic systems:

LUVOBATCH® Masterbatches	Form		Decomposition temperature [°C]	Gas yield [ml/g]	Indicative dosage	Application in						
	Granules	Microgranulate				Cast film	Blown film	Pipe extrusion	Cable extrusion	Sheet extrusion	TSG + sink marks	NUC
EV BA 5391-01		●	152	100	0,2 – 0,6 phr			●	●	●		
EV BA 5332		●	155	125	0,2 – 0,6 phr			●		●		
UC BA 1059	●		205	55	0,15 – 3 %	●	●	●	●	●	●	
UC BA 1065	●		180	75	0,5 – 2 %	●	●	●	●	●	●	
PE BA 9978	●		215	135	1 – 15 %	●	●	●		●	●	
PE BA 7038	●		210	105	1 – 15 %	●	●	●		●	●	
PP BA 5373-00	●		212	80	1 – 15 %	●	●	●	●	●	●	
EV BA 5335		●	155	100	0,2 – 1,5 phr			●	●	●	●	
EV BA 9525	●		155	100	0,2 – 2 %	●	●	●	●	●		
EV BA 9994	●		210	125	1 – 1,5 %			●	●	●	●	

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Combinations and nucleating blowing agents for fine cell structures

Mixtures of exo- and endothermic blowing agents

With the combination of both decomposition principles, the masterbatches can be optimally adapted to your applications and needs. You can benefit from the advantages of endothermic and exothermic blowing agents and also obtain a finer foam structure through the interaction of the two blowing agents.

Overview of the exothermic and endothermic combinations:

LUVOBATCH® Masterbatches	Form		Decomposition temperature [°C]	Gas yield [ml/g]	Indicative dosage	Application in						
	Granules	Microgranulate				Cast film	Blown film	Pipe extrusion	Cable extrusion	Sheet extrusion	TSG + sink marks	NUC
EV BA 9341	●	●	145	110	0,1 – 3 %					●	●	
EV BA 9551		●	150	75	0,5 – 3 phr			●		●	●	
EV BA 5348	●		145	100	2 – 4 %					●	●	
AC BA 9647 - TR		●	150	90	0,5 – 3 %					●	●	

Physical foaming

The nucleating properties of the chemical blowing agents assist in achieving a homogeneous and fine foam structure in physical and chemical foaming. Blowing agents specially developed for nucleation are the optimal supplement when it comes to homogeneous foams and optimized properties of the components.

Overview of nucleating agents:

LUVOBATCH® Masterbatches	Form		Bulk density [g/l]	Density [g/cm³]	Indicative dosage [%]
	Granules	Powder			
PE AB 9882	●		750 – 800	1,35	0,1 – 3
PE AB 9921	●		550 – 650	1,05	0,5 – 3
PW BA 9534		●	420 – 520	1,94	0,3 – 0,5

For further nucleating agents see above mentioned blowing agent tables.

Blowing agent powders – with low dosage requirements for the desired foam result

Powder based blowing agents are used alone or as a supplement for fine adjustments of masterbatches. We recommend endothermic and exothermic blowing agent powders as well as combinations of both. Please contact us and we will find the right solution for you.

Overview of the powder products:

LUVOBATCH® Masterbatches	Form		Decomposition temperature [°C]	Gas yield [ml/g]	Indicative dosage [%]	PSD (only for pure products)
	Exothermic	Endothermic				
PW BA 9510	●		145	190	0,01 – 1,5	
PW BA 9507	●		145	170	0,5 – 1,5	
PW BA 9509	●		190	165	0,1 – 1,5	
PW BA 1417	●		145	240	0,5 – 2	
PW BA 0134	●		140	190	0,5 – 1,5	
LUVOPOR ABF05	●		200	220	0,5 – 6	12 – 18
LUVOPOR ABF10	●		200	220	0,5 – 6	8 – 10
LUVOPOR ABF40	●		200	220	0,5 – 6	6 – 8
LUVOPOR ABF60	●		200	220	0,5 – 6	5 – 7
LUVOPOR ABF70	●		200	220	0,5 – 6	3 – 5
LUVOPOR OB	●		158	130	0,5 – 1,5	5 – 12
PW BA 9534		●	115	125	0,3 – 1	
PW NUK 1143		●	125	150	0,3 – 2	~ 16
PW BA 1141		●	115	140	0,05 – 3,5	~ 8
PW BA 1092		●	135	125	0,01 – 3	
PW BA 9341	●	●	155	160	0,1 – 2	

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Processing guide Injection molding

Machine requirement:

- Nozzle shut-off (strongly recommended)
- Standard screws (no degassing screws)
- Good dispersion of the blowing agent
- Dosing unit (recommended), alternatively premixing

Requirements mold/sprue:

- Mold with homogeneous temperature distribution, avoid hotspots
- Optimization of the surface: variotherm, gas back pressure

Component:

- Injection from thin to thick
- Equal flow path lengths or balanced filling

Parameters:

- Temperature injection unit:
  - Bell-shaped temperature curve
  - Temperature of first zone below decomposition temperature if possible, but high enough to melt polymer (if possible), melt temperature in later zone above decomposition temperature
- Temperature tool:
  - Depending on the goal of thermoplastic foam injection molding: Start with settings for compact injection molding, for weight reduction or surface problems. Increase mold temperature
- Increase back pressure
- Increase injection speed
- Keep decompression low
- Reduce cycle time by reducing melt viscosity
- Reduce holding pressure or remove it completely

Procedure for finding parameters:

- Set/find parameters for compact injection molding
- If necessary, adjust temperature of injection unit
- Change to material with chemical blowing agent (low dosage); adjust back pressure, holding pressure, decompression
- View component after several shots
  - Not full
    - > All parameters ok?
    - > Increase dosage of blowing agent
  - Full
    - > Reduce shot volume
  - Fine adjustment if necessary (mold temperature, injection unit temperature, injection speed, delay times, changeover point, holding pressure, ...)

Blowing Agents

Processing guide Extrusion

Machine requirement:

- Standard screws (no degassing screws), screw design must allow pressure build-up
- Good dispersion of the blowing agent
- Dosing unit (recommended), alternatively premixing
- Avoid screen packs (or other pressure consumers) upstream of the mold if possible

Requirement tool/nozzle:

- When adjusting the mold, take into account the expansion of the melt as it exits the mold

Parameters:

- Temperature extruder – mold:
  - Bell shaped temperature curve:
    - > Temperature of the first zone should be as low as possible below the decomposition temperature, but high enough to melt the polymer (if possible), melt temperature in the later zone should be above the decomposition temperature
    - > Reduce temperature to nozzle

Procedure for finding parameters:

- Set/find compact extrusion parameters
- Change to material with chemical blowing agent and start with low dosage
- Observation of component, fine adjustment if necessary (nozzle temperature, nozzle gap, haul-off speed, cooling distance)

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