EPIKOTE™ Resin MGS® LR 635
EPIKURE™ Curing Agent MGS® LH 633, 634, 635, 636 and 637

CHARACTERISTICS

Approval	DNVGL
Application	Rotor blades for wind turbines, boatbuilding as laminating and adhesive resins, sporting goods, molds, tools and other devices
Operational temperature	-60 °C up to +50 °C without heat treatment -60 °C up to +80 °C after heat treatment
Processing	At temperatures between 15 °C and 50 °C With appropriate application, the LH633 curing agent can deliver cold cure performance at temperatures as low as 5°C
Features	Pot life from approx. 10 min. up to more than 5 hours Curing agents can be mixed for intermediate reactivity
Storage	Shelf life of 24 months in originally sealed containers

APPLICATION

Laminating resin EPIKOTE™ MGS® LR 635 is an epoxy based laminating resin system with a wide range of applications. It contains no solvents and fillers and has a wide range of pot lifes. The system is used for processing of glass, carbon and aramid fibers, featuring high static and dynamic loadability.
The pot life range is between approx. 10 min. and more than 5 hours. This enables a selection of optimum system for all processing methods. After precuring at room temperature, the manufactured components are workable and demoldable. The final properties, however, will only be reached after postcuring at temperatures of more than 40°C.

Parts produced with LR635 result in high-gloss and non-tacky surfaces, even with unfavorable curing conditions, e.g. lower temperatures and/or high humidities. The mixing viscosity guarantees a fast and complete impregnation of the reinforcing fibers; however, the resin will not spill out of the fabrics on vertical surfaces.

Due to the chemical characteristics of this system we do not expect any problems concerning compatibility (e. g. blistering, tearing or changes in color), when it is processed with gelcoats. However, comprehensive tests are indispensable.

Epoxy resins are super cooled liquids and therefore crystallization is immanently possible. In an early stage, crystallization is visible as a clouding, and can progress to a stage, where the resin becomes a wax- like solid. Crystallization can be reversed by slow heating of the product to approx. 40 - 60 °C. This physical phenomenon is reversible and is no restriction to quality after removal, in fact a high purity of material will increase a tendency for crystallization.

Although LR 635 is very unlikely to crystallize at low temperatures, storage conditions of 15-30 °C and low humidity are recommended. After dispensing material, the containers must again be closed carefully, to avoid contamination or absorption of water.
All amine hardeners show a chemical reaction when exposed to air, known as „blushing“. This reaction is visible as white carbamide crystals, which could make the materials unusable.

The materials have a shelf life of minimum 2 years, when stored in their originally sealed containers.

Due to selected raw materials, we expect minimal problems concerning skin irritation and allergies during processing. The relevant industrial safety regulations for the handling of epoxy resins and hardeners and our instructions for safe processing are to be observed.

TYPICAL PROPERTIES

Property	Unit	Resin LR635
Density[1)]	g/cm³	1.12 – 1.18
Viscosity[1)]	mPa·s	2.700 – 3.700
Refractive index[1)]	–	1.564 – 1.567

Property	Unit	Curing agent		
		LH 633	LH 634	LH 635
Density[1)]	g/cm³	1.01 – 1.05	1.02 – 1.06	1.04 – 1.08
Viscosity[1)]	mPa·s	150 – 210	50 – 250	100 – 300
Refractive index[1)]	–	1.5135 – 1.5185	1.515 – 1.525	1.540 – 1.550
Pot life[2)]	min	~ 9	~ 10	~ 10
T_G,pot	°C	~ 86	~ 88	~ 84

Property	Unit	Curing agent	
		LH 636	LH 637
Density[1)]	g/cm³	1.00 – 1.07	0.92 – 0.96
Viscosity[1)]	mPa·s	80 – 140	5 – 30
Refractive index[1)]	–	1.515 – 1.521	1.445 –1.455
Pot life[2)]	min	~ 25	~ 320
T_G,pot	°C	~ 89	~ 82

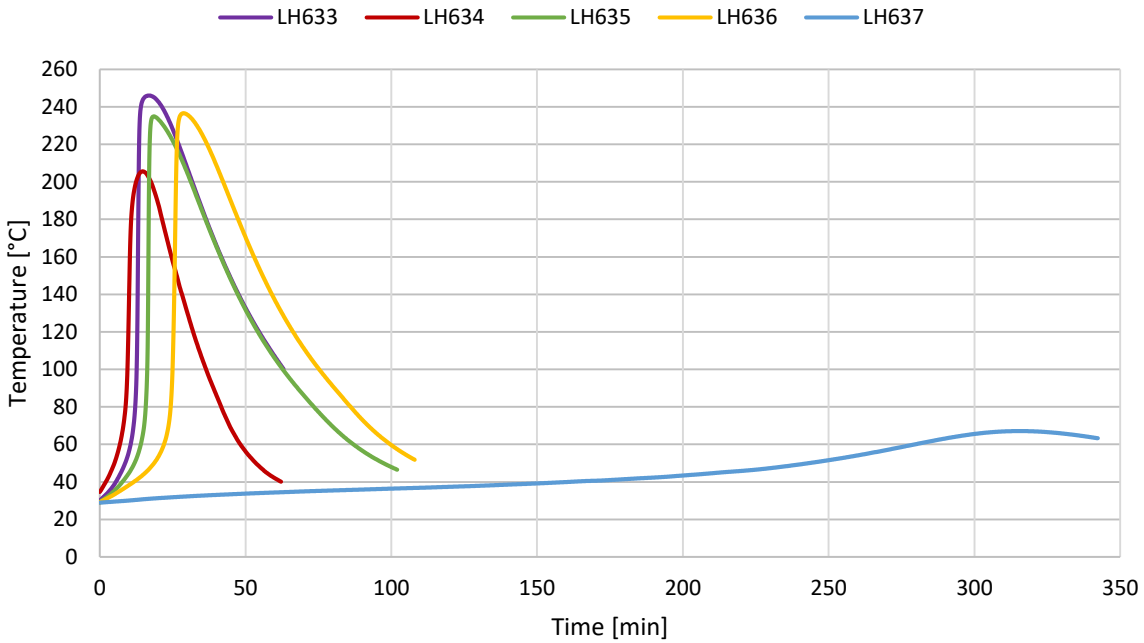
Measuring conditions:
1) measured at 25°C
2) 100g mixture of LR 635 and curing agent in water bath at 30°C

MIXING RATIO

	Parts curing agent per 100 parts resin LR635				
	LH633	LH634	LH635	LH636	LH637
Parts by weight	100 : 30 ± 2				
Parts by volume	100 : 34 ± 2	100 : 33 ± 2	100 : 33 ± 2	100 : 34 ± 2	100 : 37 ± 2

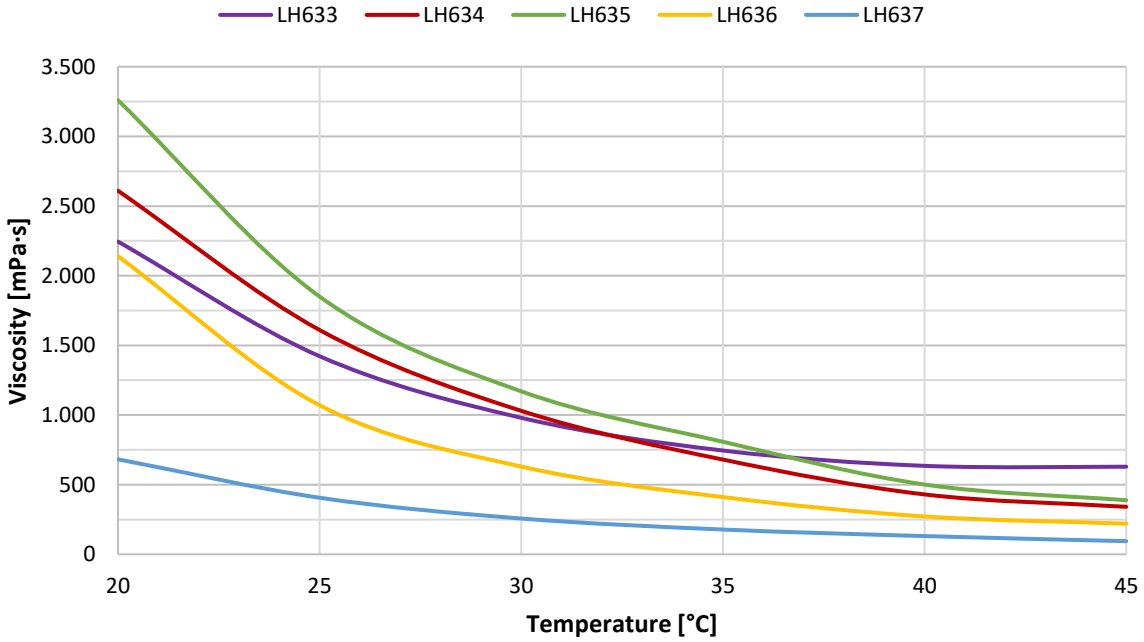
The mixing ratio stated must be observed very carefully. Adding more or less curing agent will not result in a faster or slower reaction, but in incomplete curing which can't be corrected in any way. Resin and curing agent must be mixed very thoroughly. Pay special attention to the walls and bottom of the mixing container.

TEMPERATURE DEVELOPMENT



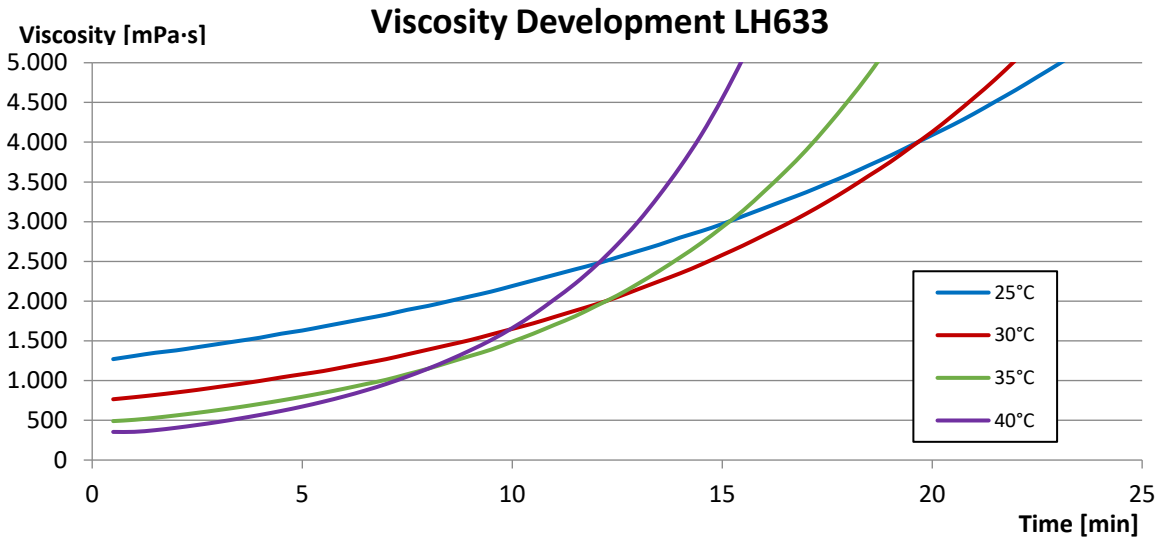
Measuring conditions:
measured 100g in a paper cup with a lid isolated in a water bath at 30°C; starting at 30°

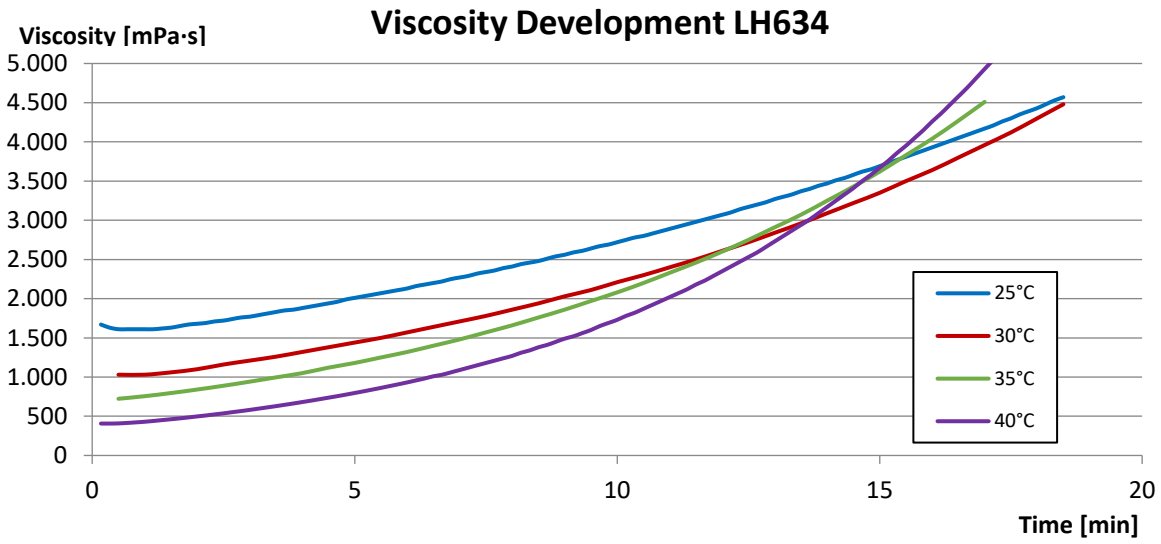
VISCOSITY OF MIXTURE

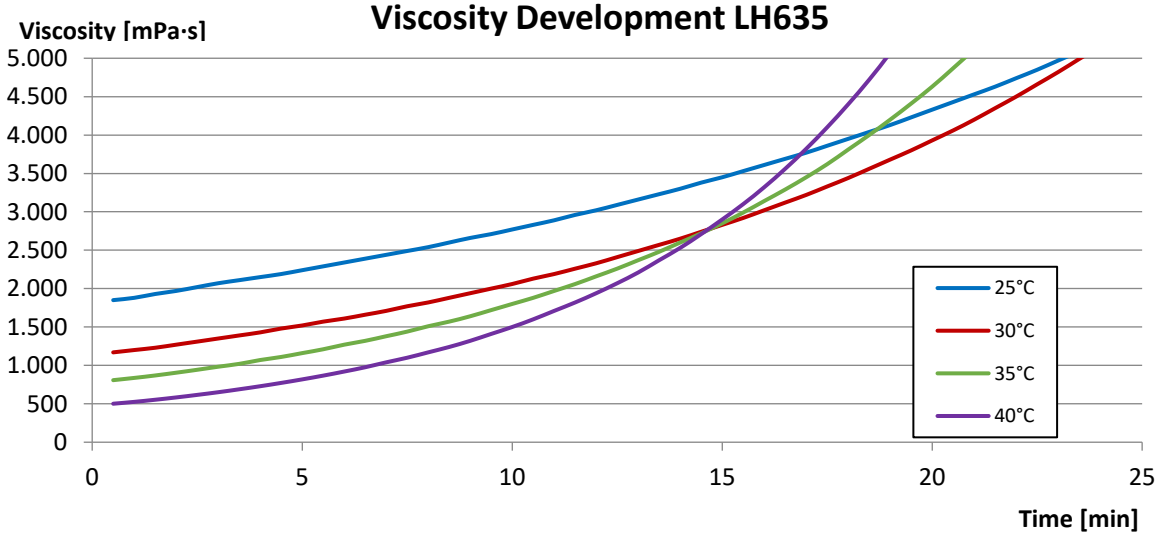


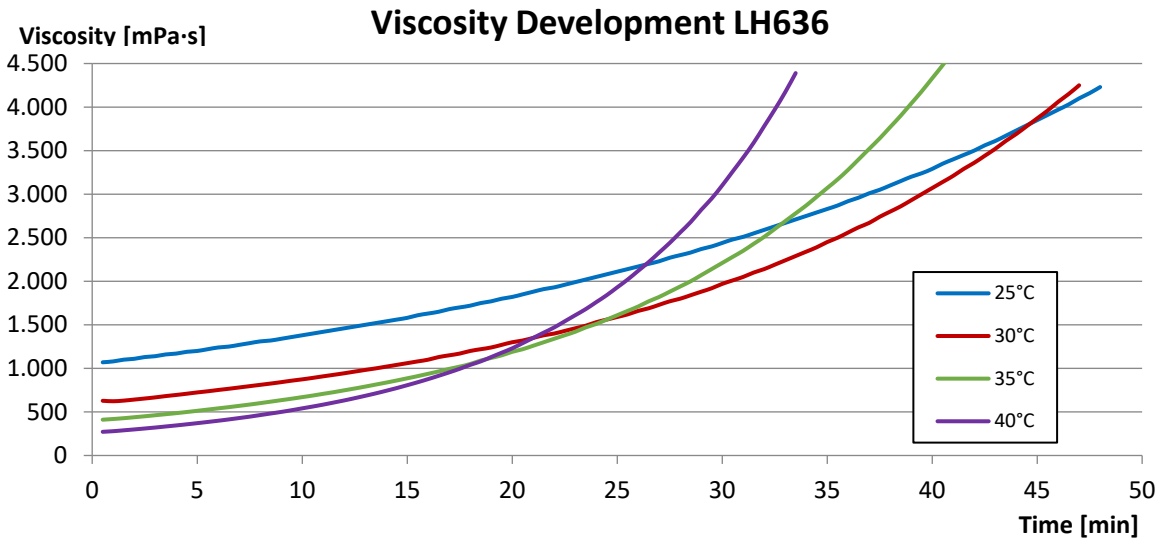
Measuring conditions: Rheometer, CP50-1, measuring gap 0.1mm

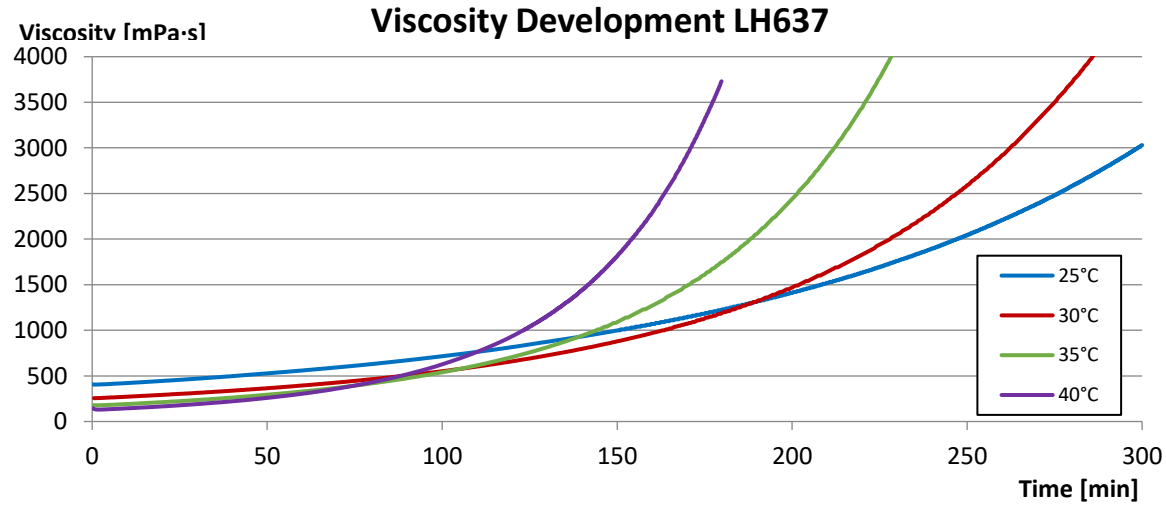
VISCOSITY DEVELOPMENT





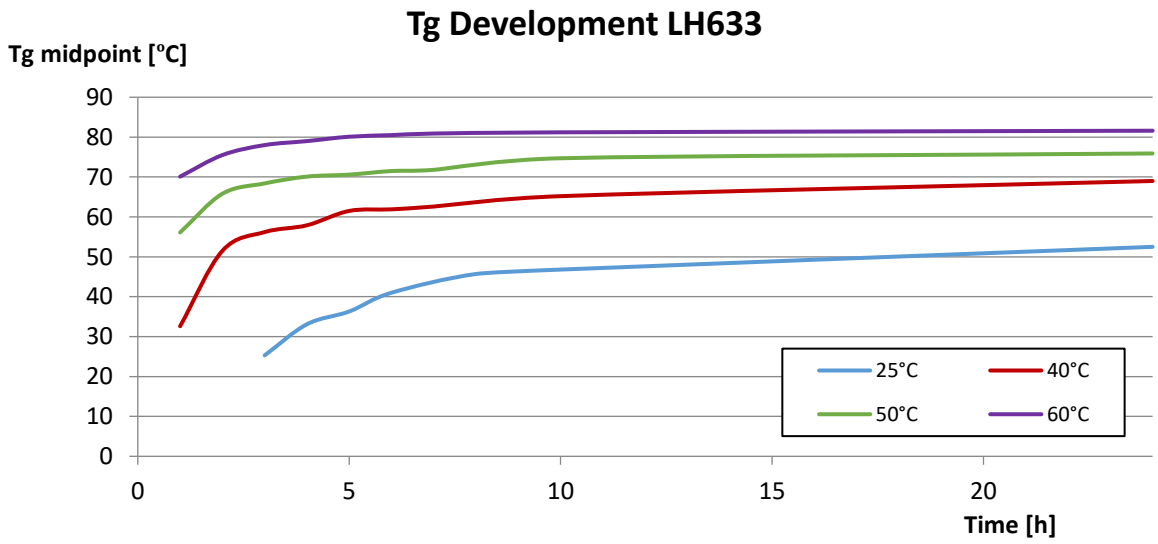


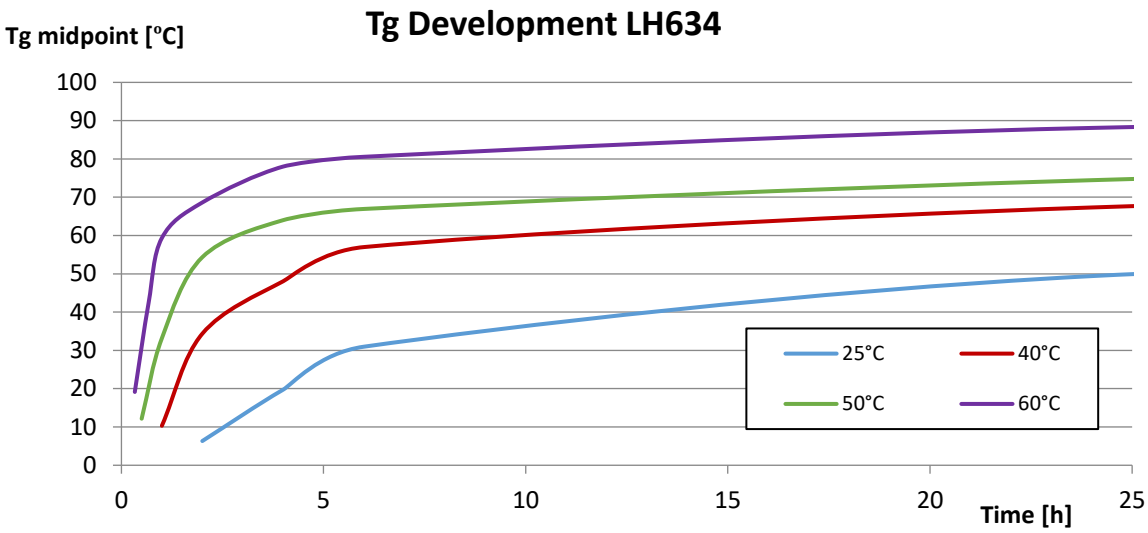


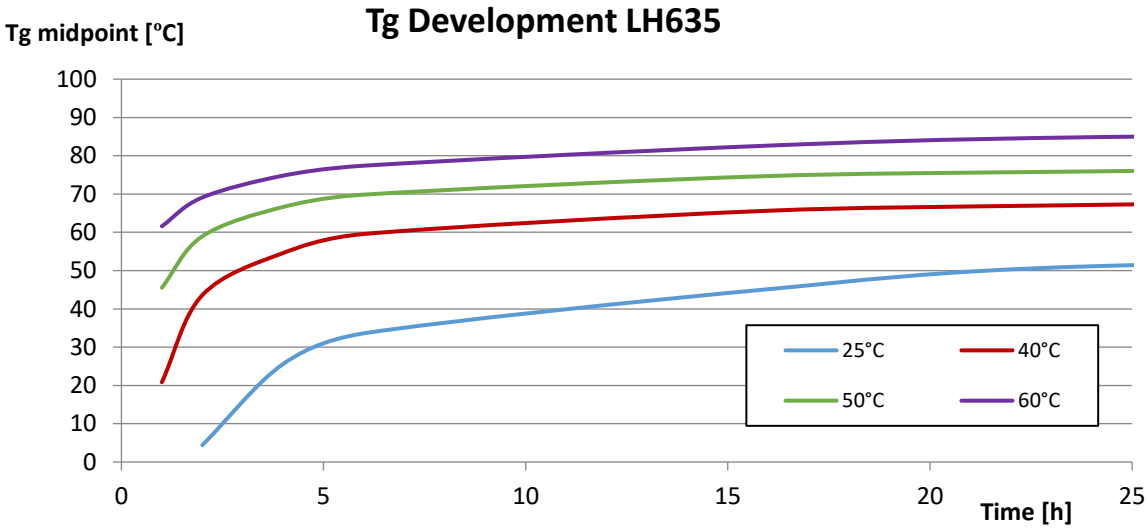


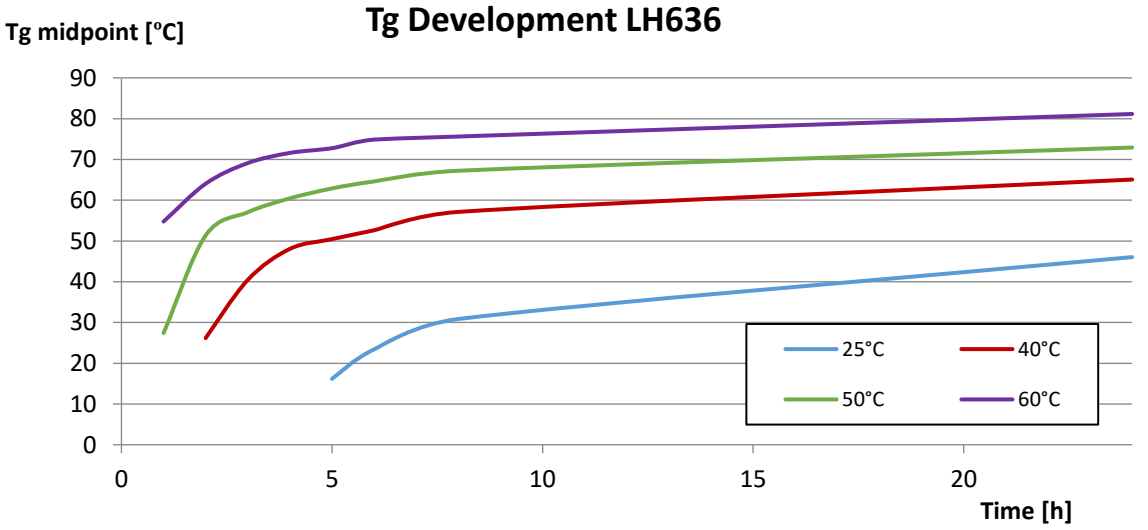
Measuring conditions: Rheometer, CP50-1, measuring gap 0.1mm

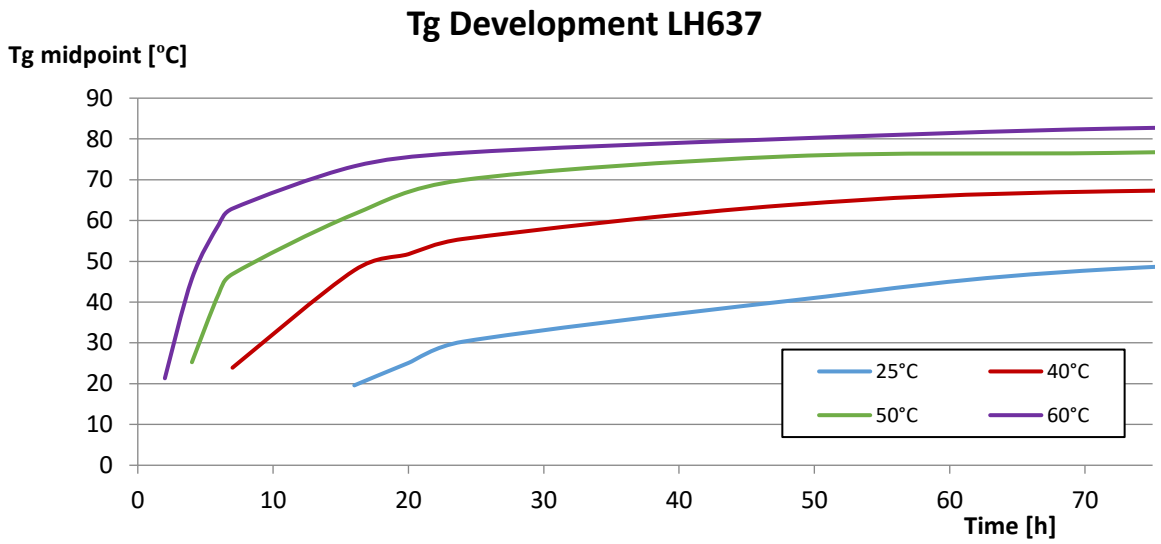
T_G DEVELOPMENT

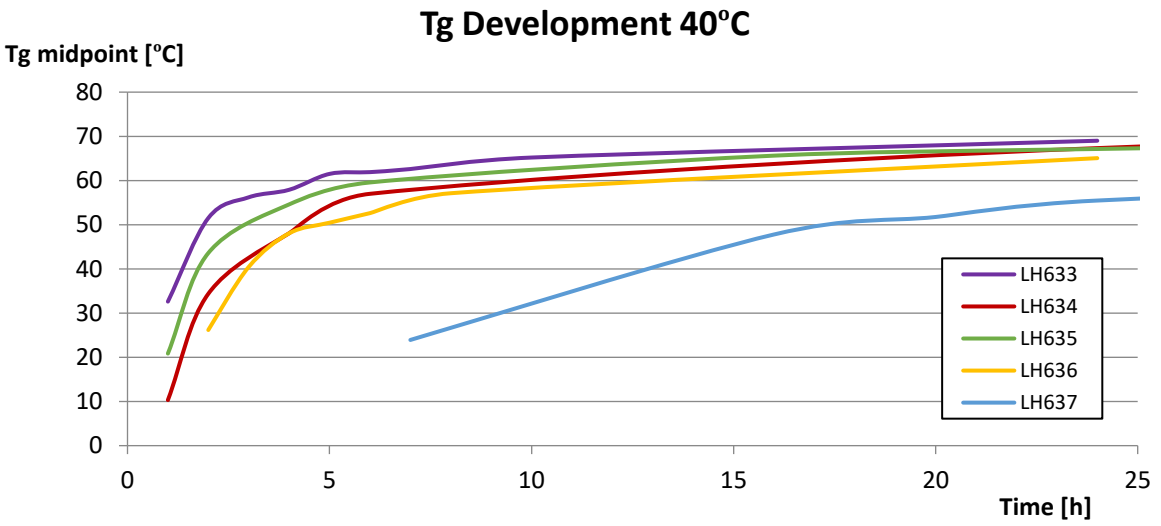


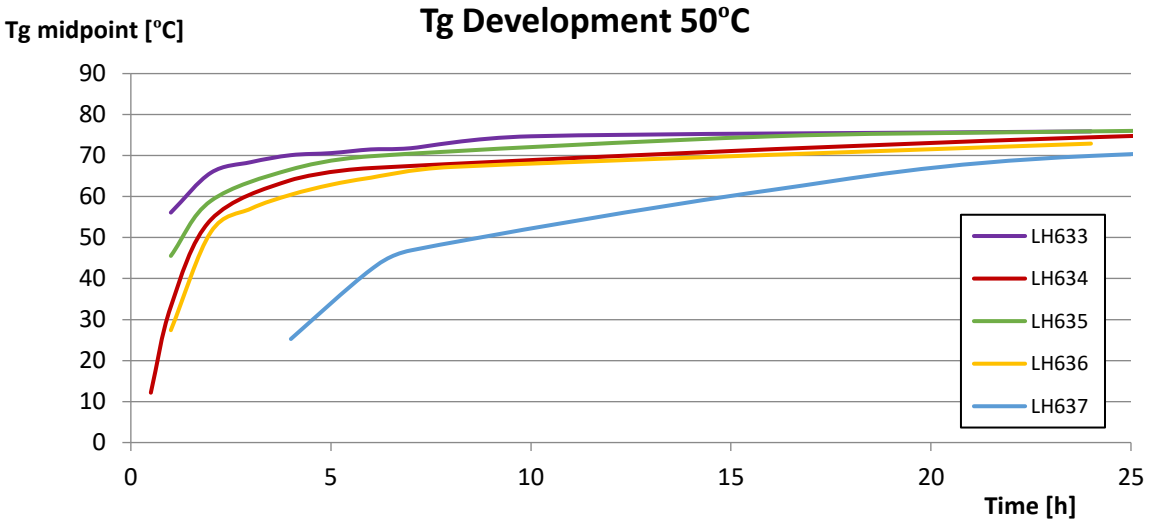

Tg Development LH634
Tg midpoint [°C]
100
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
Time [h]
25°C
40°C
50°C
60°C


Tg Development LH635
Tg midpoint [°C]
100
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
Time [h]
25°C
40°C
50°C
60°C


Tg Development LH636
Tg midpoint [°C]
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
Time [h]
25°C
40°C
50°C
60°C


Tg Development LH637
Tg midpoint [°C]
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
Time [h]
25°C
40°C
50°C
60°C


Tg Development 40°C
Tg midpoint [°C]
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
Time [h]
LH633
LH634
LH635
LH636
LH637


Tg Development 50°C
Tg midpoint [°C]
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
Time [h]
LH633
LH634
LH635
LH636
LH637

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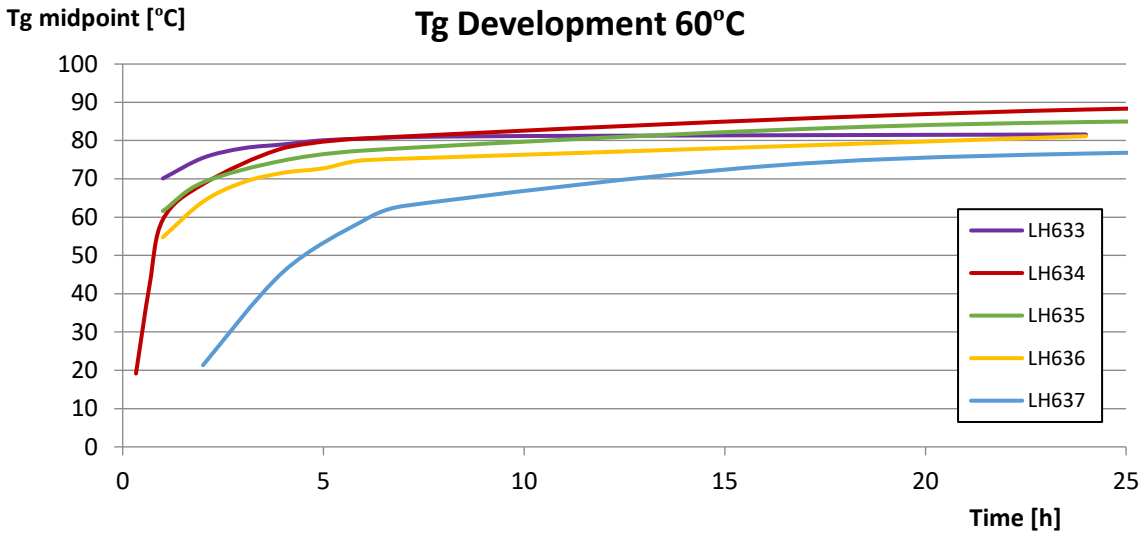

Measuring conditions: DSC-measuring heat rate: 20°C/min, sample mass 10-20 mg

PYHISICAL AND MECHANICAL DATA

Property	Unit	LH633	LH634	LH635	LH636	LH637
Cured density	g/cm³	1.15 – 1.20				
Tensile Modulus DIN EN ISO 527-2	GPa	3.2 – 3.6	3.2 – 3.6	3.4 – 3.8	3.4 – 3.8	3.0 – 3.4
Tensile strength DIN EN ISO 527-2	MPa	80 – 85	80 – 85	85 – 90	84 – 88	68 – 72
Elongation at break DIN EN ISO 527-2	%	6 – 8	6 – 8	5 – 7	5 – 8	7 – 9
Flexural modulus DIN EN ISO 178	GPa	3.1 – 3.5	3.3 – 3.7	3.6 – 4.0	3.3 – 3.7	3.1 – 3.5
Flexural strength DIN EN ISO 178	MPa	130 – 135	125 – 135	135 – 145	135 – 145	110 – 120
Curing		**3h 70°C**	**5h 70°C**	**5h 70°C**	**3h 70°C**	**5h 70°C**