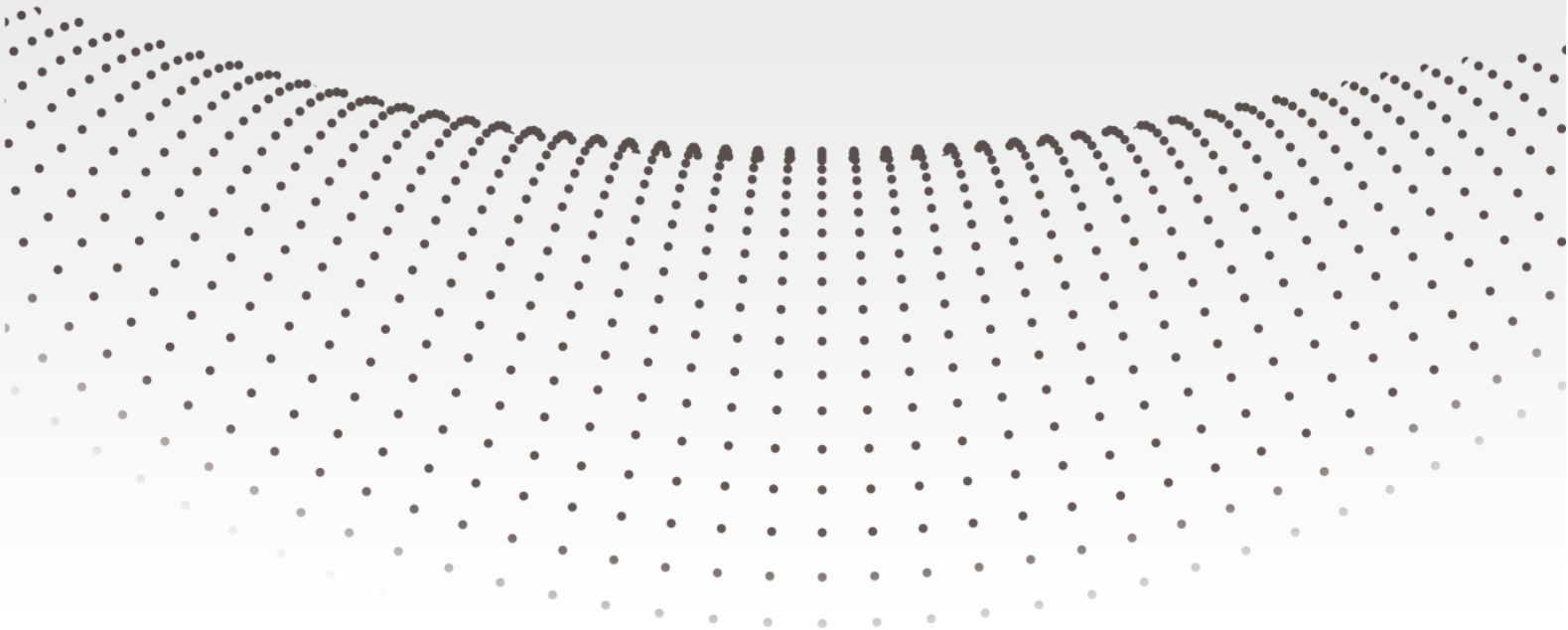
mci technologies



The MCI Technologies Company

From technical insulation to phase change materials...

Since its foundation in 1988 MCI Technologies has been manufacturing **technical insulation** for the industry.

In 2008 the company started a comprehensive program of research and development on **microencapsulated Phase Change Materials (PCM)**. It developed a range of microcapsules, called **INERTEK**, dedicated to various industrial applications: building, textile, transport, etc...

The current production capacity reaches several tons of microcapsules per week.

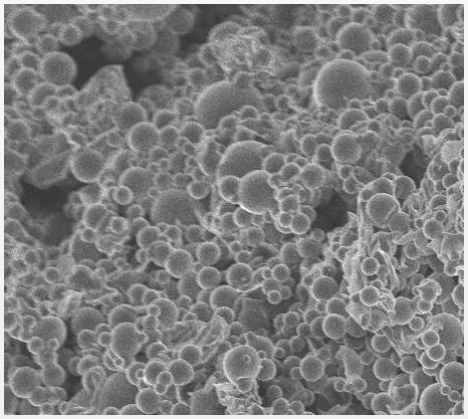
Since 2012, WINCO Technologies has been marketing the first interior energy storage coating embedding INERTEK technology.

MCI Technologies is **ISO 9001** and **ISO 14001** certified.

INERTEK Microcapsules

Description

The principle of microencapsulation is to form a resistant envelope around phase change material microparticles. INERTEK microcapsules, with a size ranging from **5 to 25 µm**, can be incorporated into other products: coatings, plasterbooards, insulation, technical textiles, etc...

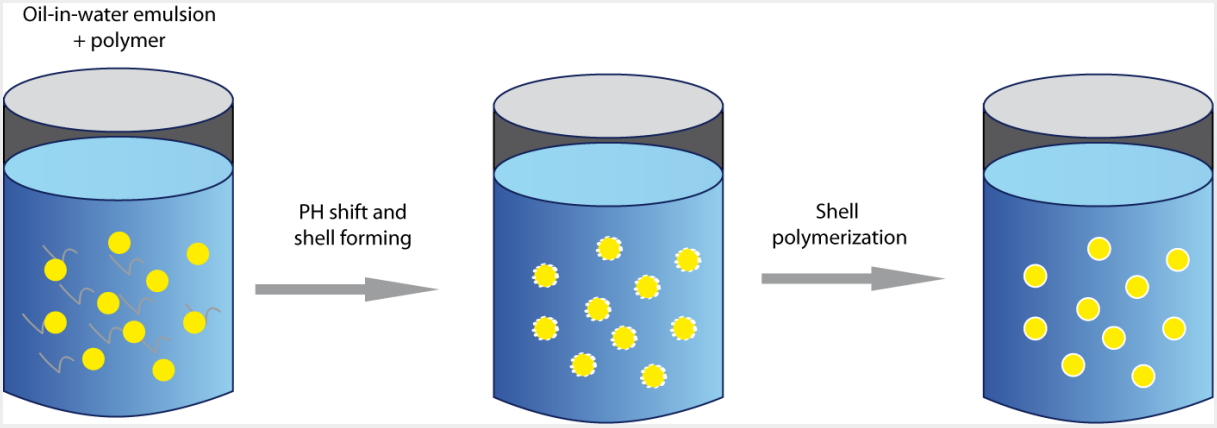


x 1000 Magnification of INERTEK microcapsules

INERTEK Microcapsules are available in 2 forms:

Powder or **Slurry**.

Manufacturing process



INERTEK microcapsules are produced by in **situ polymerization**. This process is repeatable on a wide spectrum of internal phases: phase change materials , biocides, perfumes.

The Benefits of INERTEK Microcapsules

- ***A wide range of melting temperatures***

  The INERTEK range includes 9 references, with melting temperatures ranging from 5 °C to 70 °C.

  Other phase change materials (customization of the phase change range) can be microencapsulated on request.

- ***A high latent heat***

  MCI Technologies selected for its INERTEK microcapsules range, pure internal phases with high latent heat.

  Microcapsules INERTEK offer a high thermal performance and ease of integration into other products.

Project : PCM integration into a plasterboard Customer goal : get a storage capacity of 330 kJ/m^2		
Product	Latent Heat	Requiered quantity per m^2
INERTEK 23 S	**180 J/g**	**1.83 kg/m^2**
Microcapsules from competition	110 J/g	3 kg/m^2
Conclusion : With INERTEK 23 S, 40% lower load compared to microcapsules from competition.		

- ***Increased lifespan***

  The internal phases used in the INERTEK microcapsules have stable thermal properties over time.

  The INERTEK range follows a double ageing protocol:

  - Laboratory accelerated ageing by calorimeter.
  - Thermal chamber ageing on finished products.

- ***The use of bio-based products***

  INERTEK 21, 23 and 26 microcapsules are made exclusively from vegetable waxes.

INERTEK Range

Main range

Product		Phase change range		Latent heat
		Melting aera	Solidification aera	
INERTEK 5	Slurry	4 - 6 °C	1 - (-3) °C	210 J/g
	Powder	5 - 6 °C	0 - (-2) °C	175 J/g
INERTEK 21	Slurry	20 - 22 °C	21 - 18 °C	125 J/g
	Powder	Not measured	Not measured	Not measured
INERTEK 23	Slurry	23 - 27 °C	23 - 18 °C	180 J/g
	Powder	23 - 27 °C	23 - 18 °C	160 J/g
INERTEK 26	Slurry	26 - 28 °C	26 - 24 °C	200 J/g
	Powder	26 - 28 °C	26 - 24 °C	175 J/g

Complementary range

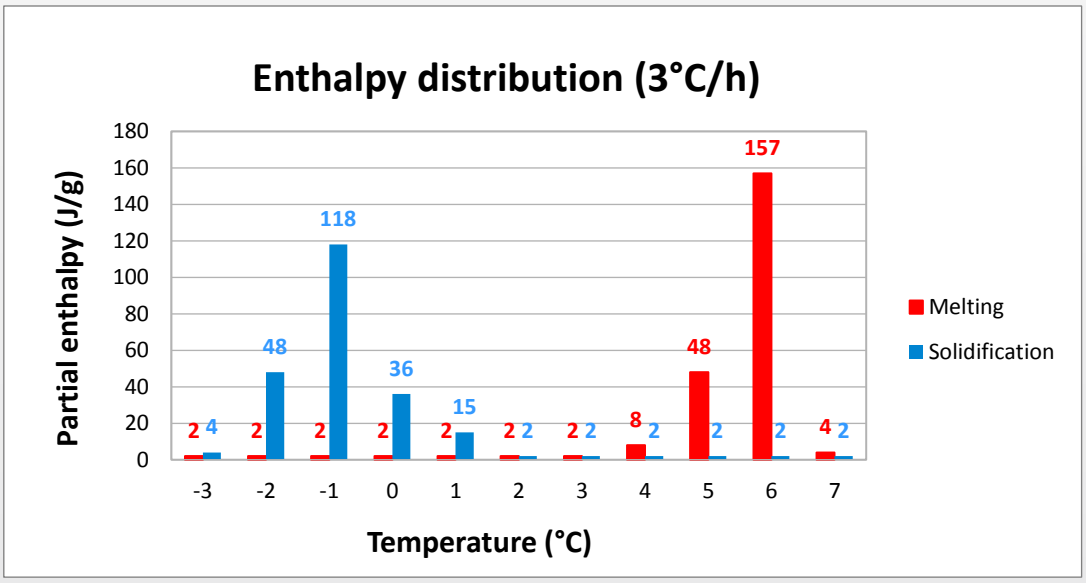
Product		Melting point	Latent heat
INERTEK 18	Slurry	18 °C	200 J/g
	Powder		180 J/g
INERTEK 32	Slurry	32 °C	200 J/g
	Powder		180 J/g
INERTEK 39	Slurry	39 °C	240 J/g
	Powder		205 J/g
INERTEK 56	Powder	56°C	205 J/g
INERTEK 70	Powder	70°C	190 J/g

INERTEK 5

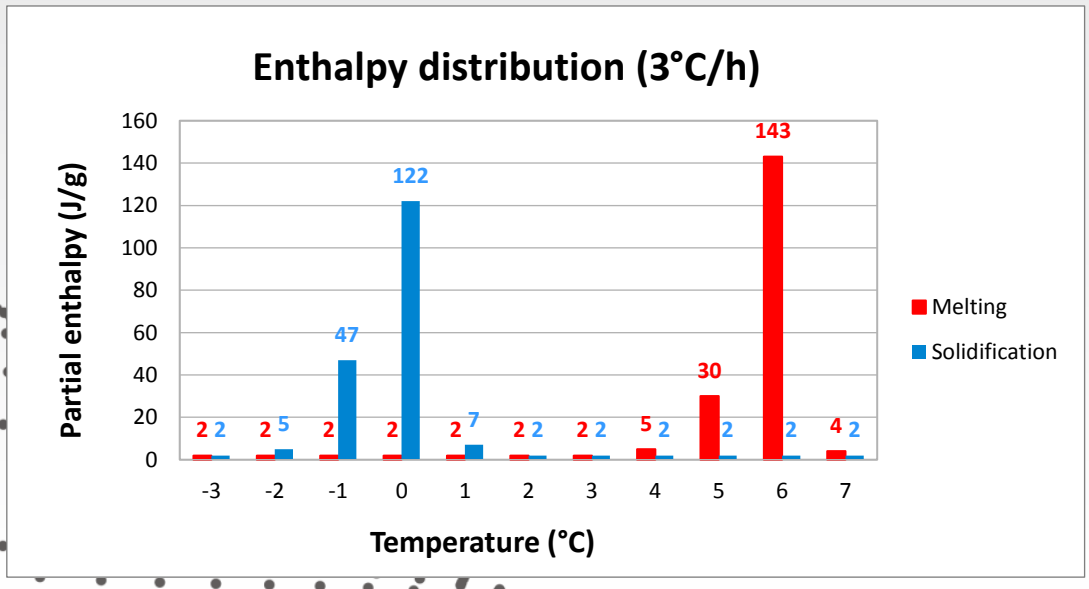
Product		Phase change range		Heat storage capacity*
		Melting aera	Solidification aera	
INERTEK 5	Slurry	4 - 6 °C	1 - (-3) °C	250 J/g (69 Wh/kg)
	Powder	5 - 6 °C	0 - (-2) °C	215 J/g (60 Wh/kg)

* combination of latent heat and sensible heat in a temperature range of (-10) - 10 °C

Slurry : INERTEK 5 S



Powder : INERTEK 5 P

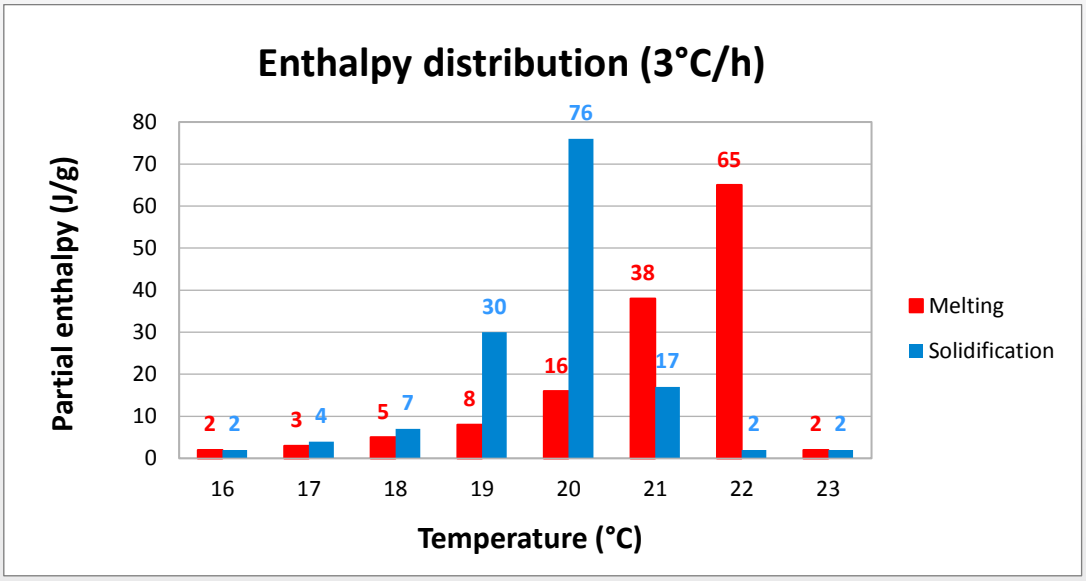


INERTEK 21

Product		Phase change range		Heat storage capacity*
		Melting aera	Solidification aera	
INERTEK 21	Slurry	20 - 22 °C	21 - 18 °C	165 J/g (46 Wh/kg)

* combination of latent heat and sensible heat in a temperature range of 5 - 25 °C

Slurry : INERTEK 21 S

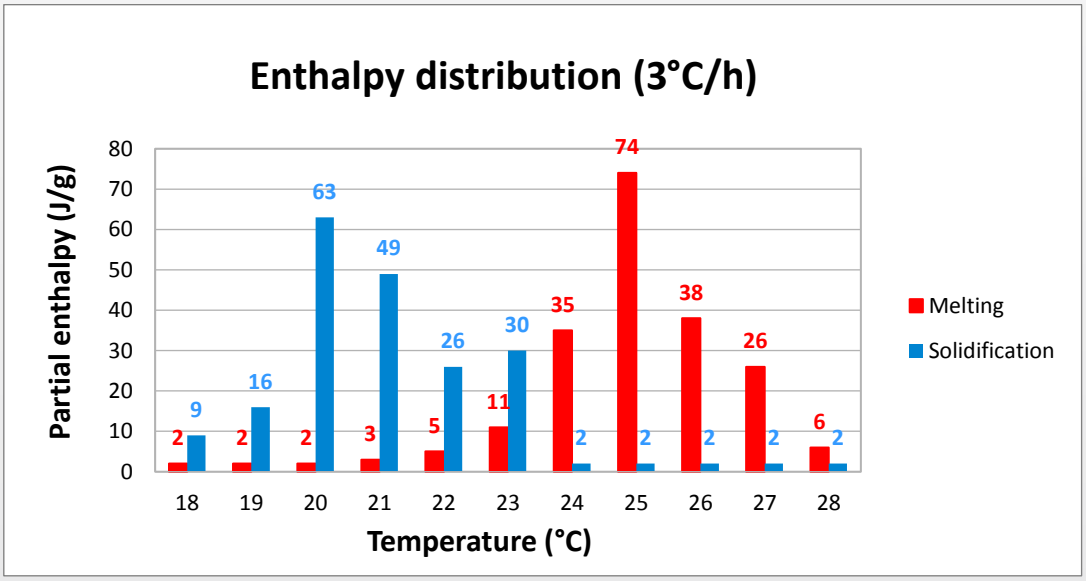


INERTEK 23

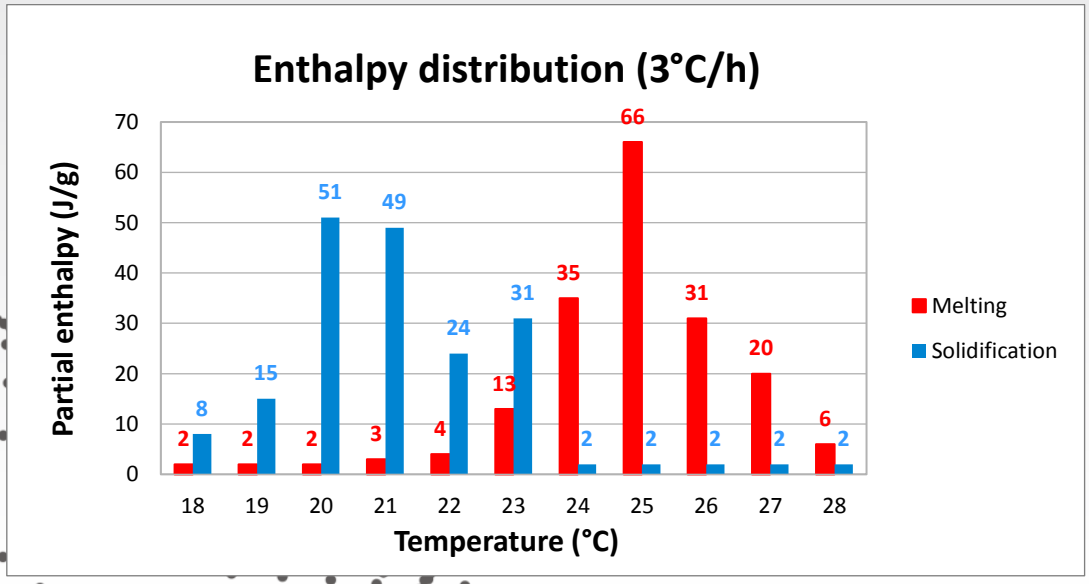
Product		Phase change range		Heat storage capacity*
		Melting aera	Solidification aera	
INERTEK 23	Slurry	23 - 27 °C	23 - 18 °C	220 J/g (61 Wh/kg)
	Powder	23 - 27 °C	23 - 18 °C	200 J/g (56 Wh/kg)

* combination of latent heat and sensible heat in a temperature range of 10 - 30 °C

Slurry : INERTEK 23 S



Powder : INERTEK 23 P

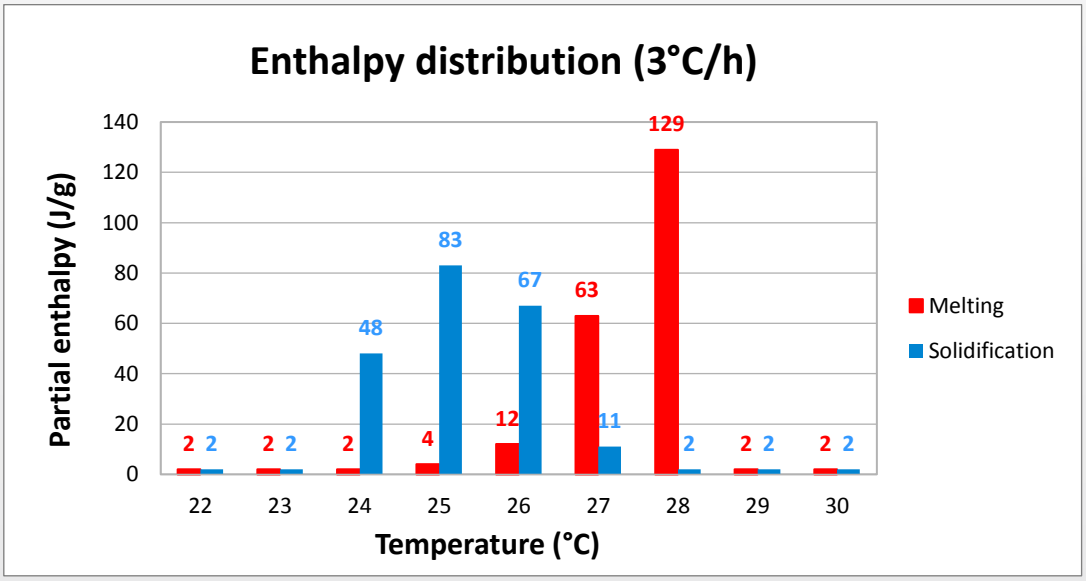


INERTEK 26

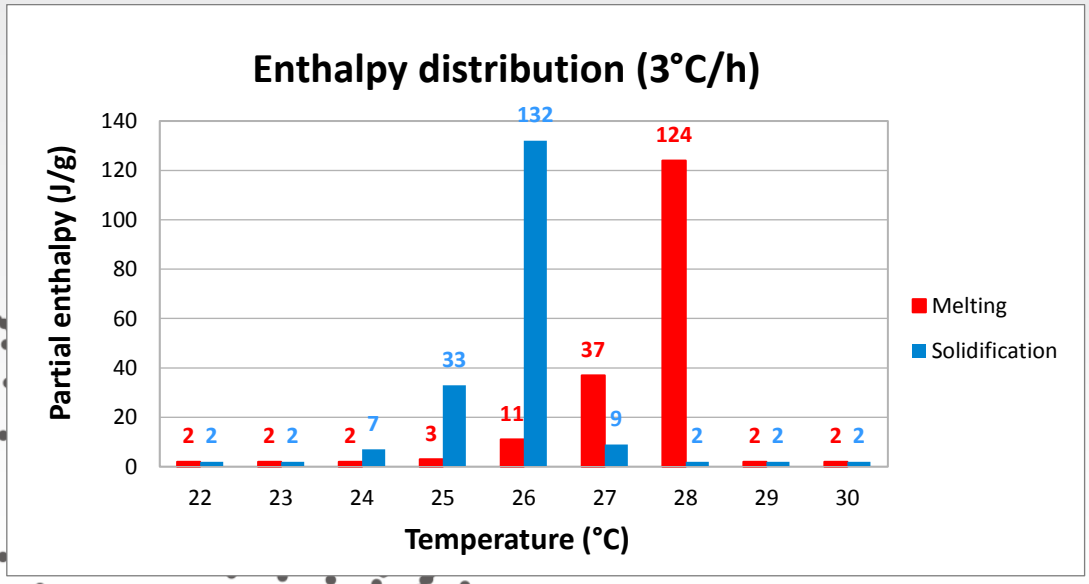
Product		Phase change range		Heat storage capacity*
		Melting aera	Solidification aera	
INERTEK 26	Slurry	26 - 28 °C	26 - 24 °C	240 J/g (67 Wh/kg)
	Powder	26 - 28 °C	26 - 24 °C	215 J/g (60 Wh/kg)

* combination of latent heat and sensible heat in a temperature range of 15 - 35 °C

Slurry : INERTEK 26 S



Powder : INERTEK 26 P



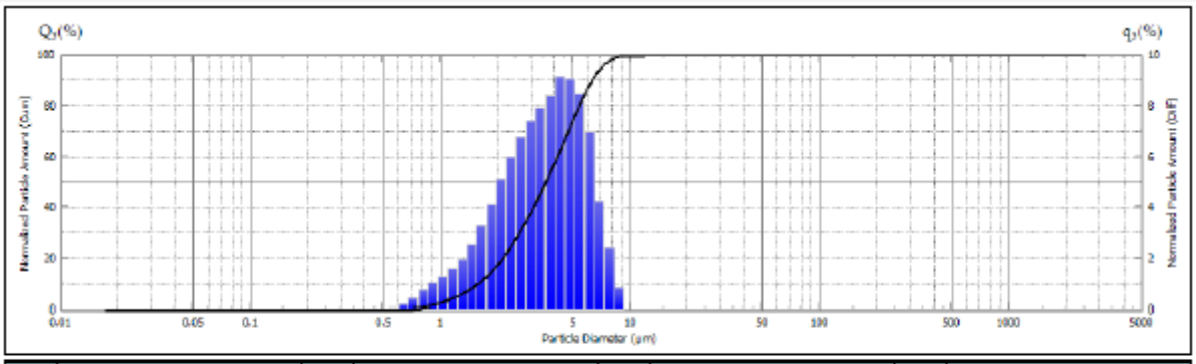
Quality

MCI Technologies is ISO 9001 certified. A quality monitoring plan was implemented on the INERTEK microcapsules.

Three main types of checks are carried out:

- ***Particle size***

The distribution of INERTEK microcapsules sizes is controlled during and at the end of the manufacturing, in order to ensure that it complies with our customers requirements.



	Cum% Q(%)	Diam x(µm)		Cum% Q(%)	Diam x(µm)		Cum% Q(%)	Diam x(µm)		Cum% Q(%)	Diam x(µm)
1	90.000	6.274	4	60.000	4.113	7	30.000	2.586			
2	80.000	5.379	5	50.000	3.560	8	20.000	2.103			
3	70.000	4.687	6	40.000	3.059	9	10.000	1.571			

- ***DSC (Differential scanning calorimetry)***

The thermal performance constancy of INERTEK microcapsules is checked by performing a DSC measurement on each production batch.

- ***Ageing tests***

To ensure their lifespan, INERTEK microcapsules are subject to a double ageing protocol:

  - Laboratory ageing
  - Thermal chamber ageing under real use conditions

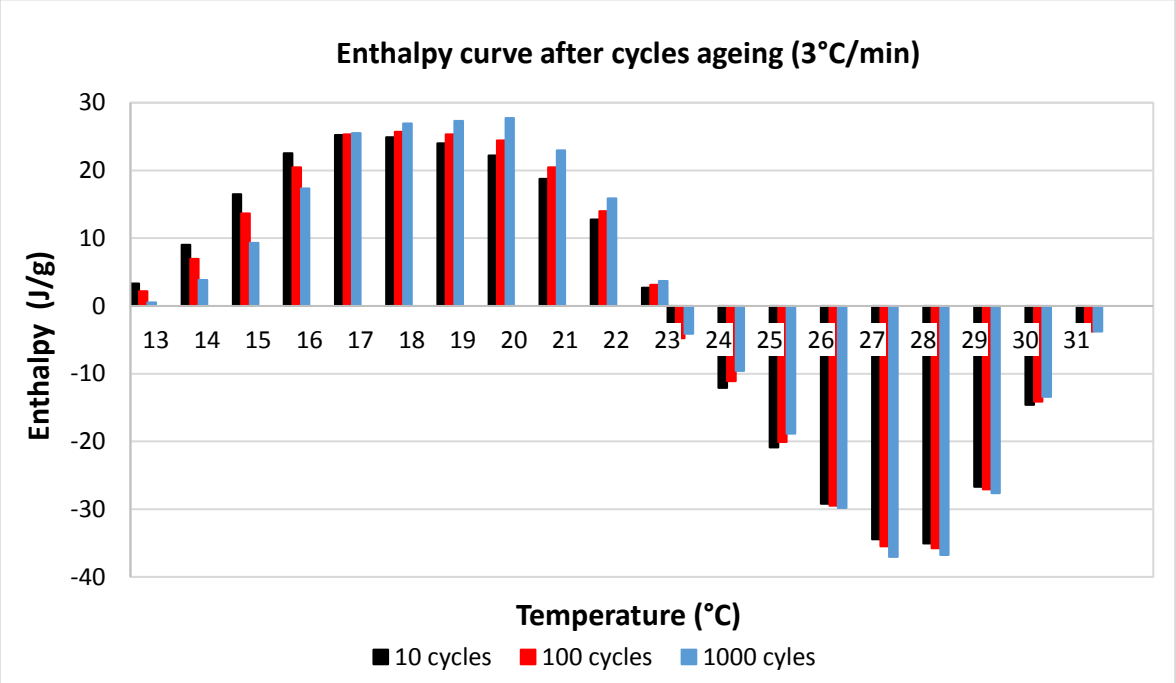
Ageing Tests

Laboratory ageing

INERTEK 23 S example :

Ageing carried out by calorimeter, including 1000 cycles composed of 2 segments:

- 3 ° C/min heating from 6 to 33 ° C.
- 3 ° C/min cooling from 33 to 6 ° C.



Cycles number	INERTEK 23 S Latent heat (J/g)
10	182.04
1 000	181.28
Gap : 0.42 %	
Conclusion: There is no alteration of INERTEK 23S thermal performance after 1000 cycles.	

Thermal chamber ageing under real use conditions

MCI Technologies recommends to its customers another type of ageing: ageing on finished products in a climate chamber.

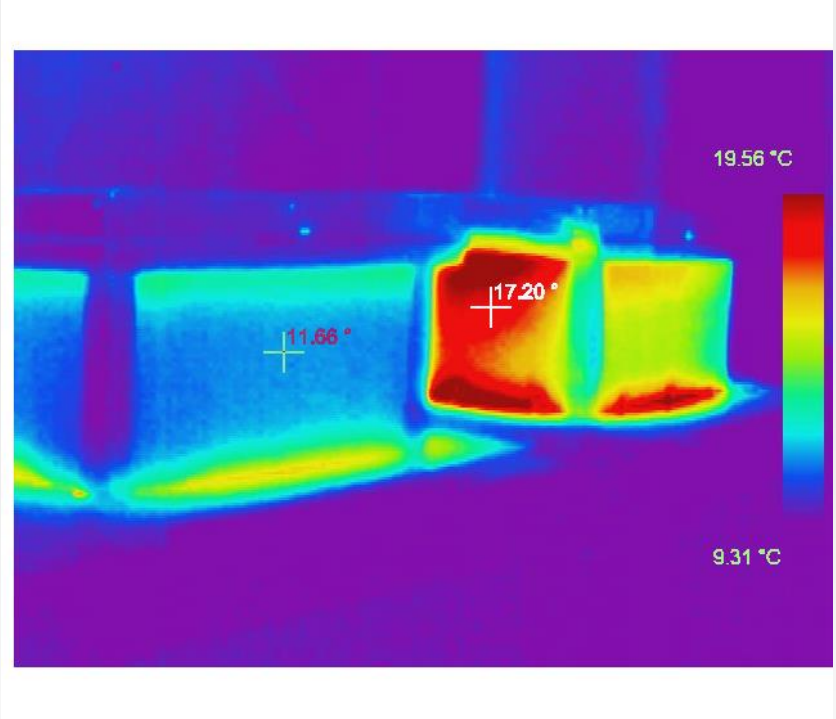
For this, we provide our customers with a thermal chamber to simulate ageing under real use conditions of products integrating INERTEK microcapsules.

Product Development Support

MCI Technologies offers to its customers technical support to assist them in the development of products incorporating INERTEK microcapsules.

- ***Formulation support***
- ***Qualification support***
- ***Products ageing follow-up***
- ***Thermal study***

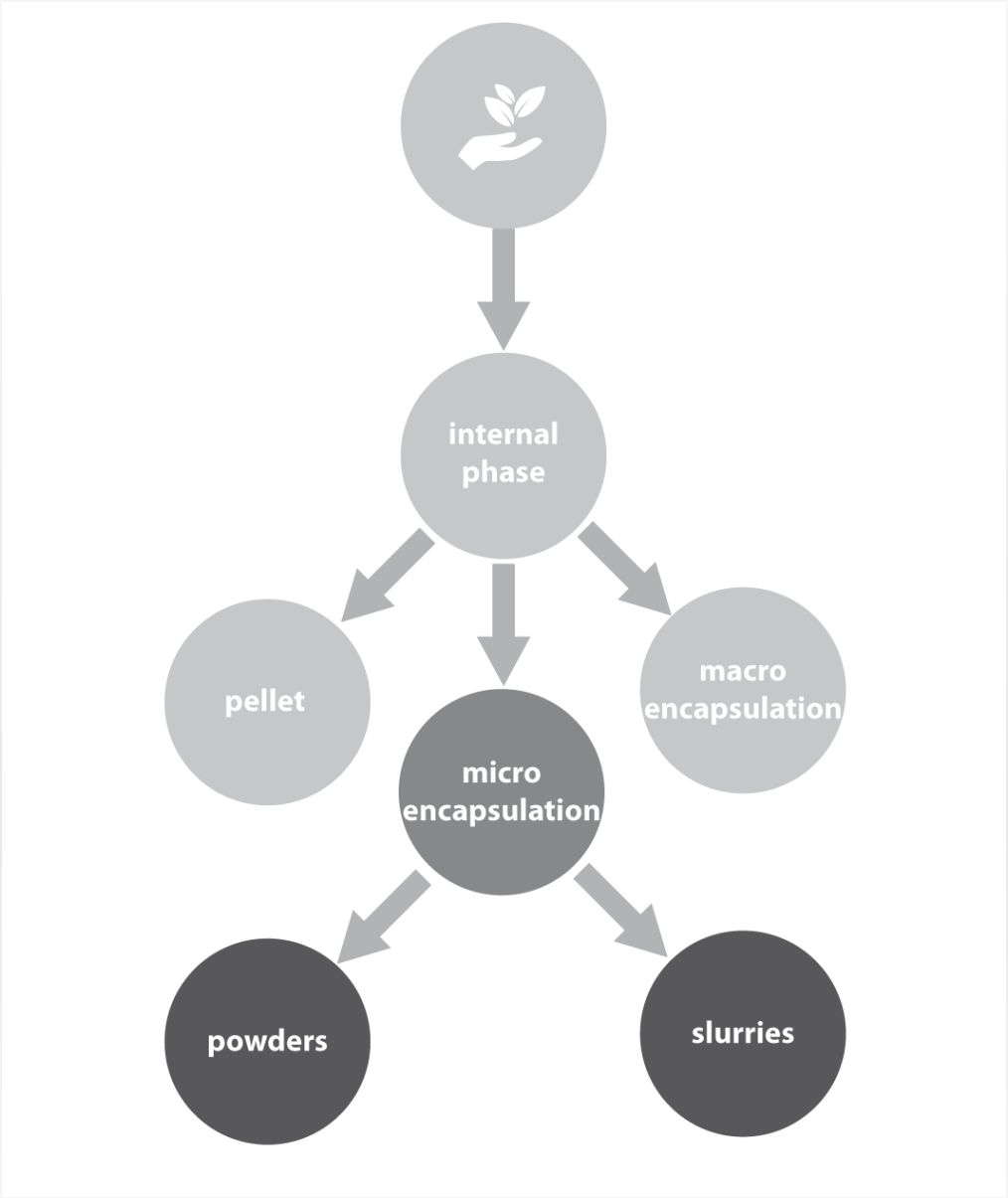
MCI Technologies uses dynamic thermal simulation softwares like **TRNSYS** and **Design Builder** allowing phase change materials modeling.



Other PCM-Based Products

If MCI Technologies is specialized in the microencapsulation of phase-change materials, it also offers:

- Integration of phase-change materials in the form of pellets.
- Integration of phase-change materials into hermetic containers : macroencapsulation.



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