FUNCTIONAL polymer additives

Thermally Expandable Microspheres

Our TEM Series thermally expandable microspheres are composed of a thermoplastic polymer closed-shell where liquid hydrocarbon is encapsulated. When heated, the hydrocarbon contained inside suddenly expands, and the shells soften, forming micro-bubbles, resulting in an great increasing volume of the microspheres upto 80-100 times. The density of expanded microspheres can be **lower than 30 kg/m^3 (0.03 g/cm^3)** which makes them an ideal lightweight filler and a foaming/blowing agent for all kinds of plastics and rubber.

Expandable, with unlimited possibilities

Advantages over other microspheres

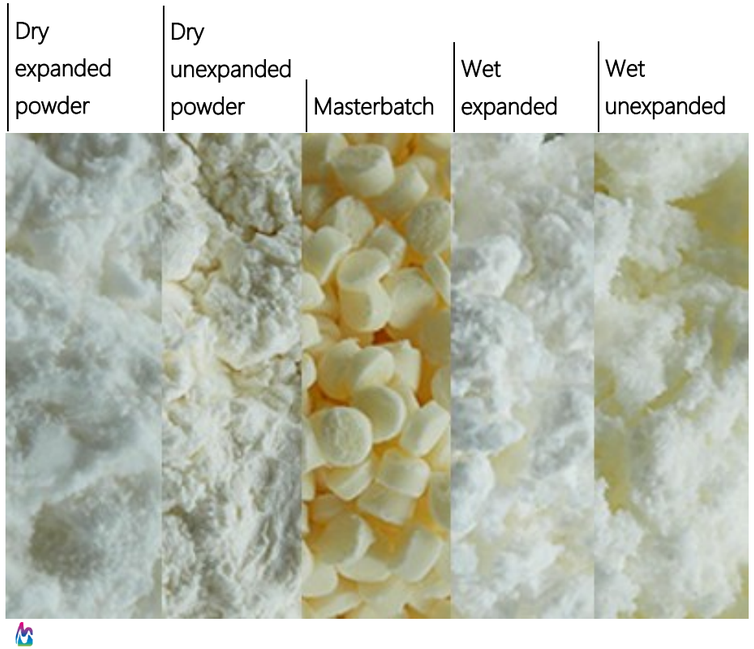
Glass, ceramic, metalic, polymer spheres are all marketed as "**microspheres**". Each has its unique properties, manufacturing method or synthetization, because of which, they are not interchangeable within a particular application. However, they do sometimes overlap in applications. For instance, most of the above mentioned products can be used to increase volume, or to reduce cost, weight, insulate or modify surface finishes. **Thermally expandable microspheres** are unique because they have all of above mentioned attributes. They also have performance features with chemical blowing agents and foaming agents but without instabilities.

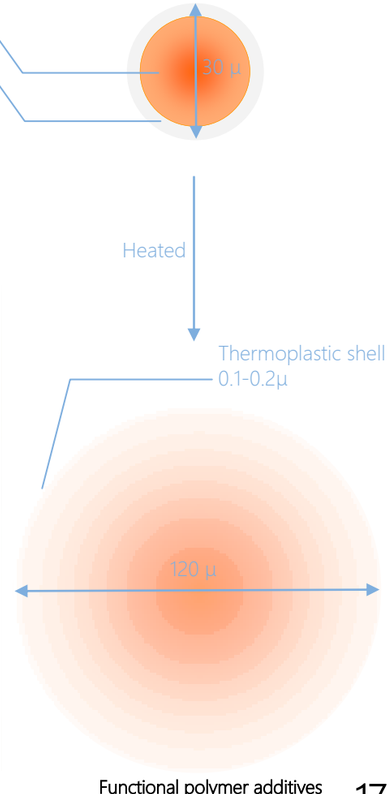
Available delivery forms

TEM Series is available in either expanded or unexpanded forms, in wet or dry, and even masterbatch form. They work well in systems with or without heat or water. We offer a variety of chemical compositions to give expansion at different temperatures.

Wide range of delivery form and expanded sizes makes it possible to achieve a lot of surface effects, including thickness, matting, smoothness and roughness. The very low density gives a significant weight reduction even at small dosages.

Big change starts small.



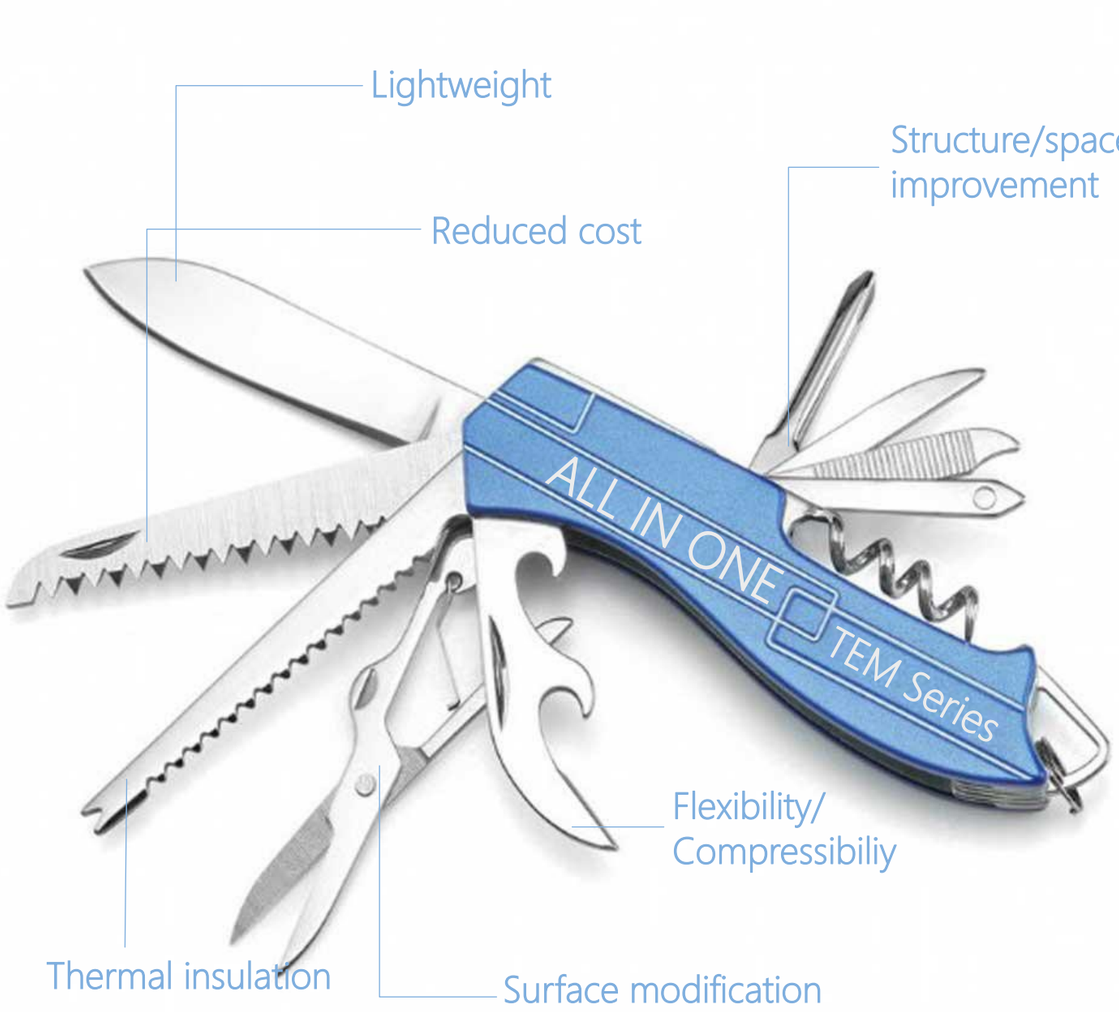


Thermally Expandable Microspheres

"The most hardworking horse"

Expandable,
with unlimited possibilities

Our TEM Series thermally expandable microspheres deliver a variety of desirable advantages to your products depending on the applications, such as reduced cost, lightweight, enhanced flexibility and fascinating textures. They are versatile additives for coatings, printing inks, plastics, rubbers and other wide range of applications.



Features and benefits

Lightweight

The density of expandable microspheres is only 1/50 of that of water. This property makes it an ideal lightweight filler, while maintaining or increasing the total volume Incorporation of the microspheres to the original materials will dramatically reduce the overall weight of final products without losing other orginal properties of the products.

Surface modification/space improvement

Microspheres can be added as a simple and efficient way of surface modification of the printing inks. Various surface effects could be achieved by adjusting the amount and size of microspheres without interrupting the original process. When the printing is heated to certain temperatures at which the microspheres expand, making different particle-sized "bubbles", achieving numerous surface appearances and touch. Different partilce sizes can achieve a wide range of suface effects, including matting, smoothness and roughness.

By properly controling the the foaming process, it would be possible to achieve various surface effects through different foaming temperatures. Expandable microspheres can be incorporated to the printing ink as a foaming agent, and printed on a surface of paper, non-woven fabric or textile by gravure or screen printing, desirable surfaces like 3D effect, puff, velvet nubuck or suede textures would be achieved. Further more, it gives excellent tactility with anti-slip surface. This property finds good use in wallpaper, artificial leather, textile printing and more products.

Flexibility/compressibility

The closed-cell structure of microspheres make them compressable under pressure, but able to go back to the original size after the pressure is released. This give them excellent comressibility and flexibility and thus could be applied in various fields including but not limited to thermoplastic materials as thermoplastic elastomers or rubber.

Reduced cost

Expandable microspheres can be used as a lightweight filler, while maintaining the total volume of final products with small dosage, replacing the heavier original materials. Therefore, the raw material cost will be substantially reduced.

Thermal insulation/low thermal conductivity

The microspheres are expandable after being heated and will form an inflatable closed cavity with good insulation. Through consistent and accurate particle size distribution, they offer low thermal conductivity to provide extremely efficient thermal insulation properties. According to statistics, only 1.5% expanded microspheres combined with the thermal insulation coating can effectively reduce the thermal conductivity by 50%. Excellent thermal insulation makes them suitable for use in reflective cool roof paints and heat insulation interior paints.

Structure/space improvement

Unexpanded microspheres are excellent blowing agent that gives highly controlled foaming, achieving a fine and uniform closed cell structure. The expanded uniform and closed cell microspheres improve the material structures and create many other excellent properties. This makes microspheres a better blowing agent than traditional chemical blowing agents and achieve excellent performance at low viscosities.

ALL IN ONE

Thermally Expandable Microspheres

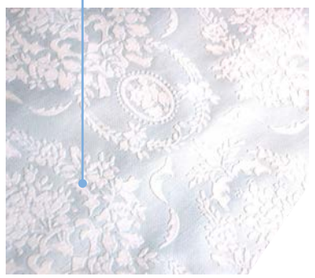
"The most hardworking horse"

Shoe soles

- lightweight
- flexibility
- shock absorption

Wallpaper printing

- 3D, matting surface effects
- uniform closed cell structure

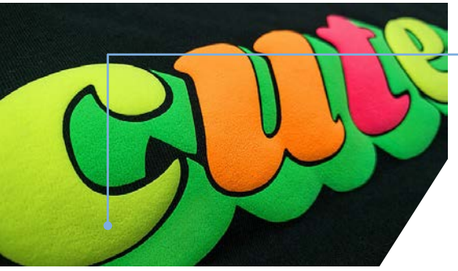


Cool-roof coatings

- excellent reflection
- hermal insulations,
- ight weight

Printing inks

- various surface effects
- uniform closed cell structure
- low energy consumption
- environmetal friendly



Artificial leather:

- good filling performance
- various surface effects
- low shirinkage
- good flexibitily

Modelling clay

- light weight
- easy to shape
- low shirinkage after drying
- good durabiliy
- Safe to use

General grades

Expandable, with unlimited possibilities

Temperature range	Code	Delivery form	Expanded/unexpanded	Average Particle Size	Temperature-Start	Temperature-Max	Expanded particle density	Solid content	
Low	LW120B	Wet	Unexpanded	18-23μm	80-90℃	118-125℃	< 15 kg/m³	70-75%	
	LD120B	Dry	Unexpanded	18-23μm	80-90℃	118-125℃	< 15 kg/m³	> 97%	
	LW130B	Wet	Unexpanded	15-25μm	90-100℃	125-135℃	< 10 kg/m³	70-75%	
	LW150A	Wet	Unexpanded	8-15μm	95-110℃	140-150℃	< 15 kg/m³	70-75%	
	LDE150A	Dry	Expanded	20-40μm				> 97%	
	LWE150A	Wet	Expanded	20-40μm				15±2%	
	LW150B	Wet	Unexpanded	15-25μm	95-110℃	140-150℃	< 15 kg/m³	70-75%	
	LDE150B	Dry	Expanded	40-60μm			35±5 kg/m³	97%	
	LWE150B	Wet	Expanded	40-60μm			35±5 kg/m³	15±2%	
	LDE150C	Dry	Expanded	60-80μm			25±5 kg/m³	97%	
	LWE150C	Wet	Expanded	60-80μm			25±5 kg/m³	15±2%	
	LDE150D	Dry	Expanded	80-120μm			20±5 kg/m³	97%	
	LWE150D	Wet	Expanded	80-120μm			20±5 kg/m³	15±2%	
	LD150B	Dry	Unexpanded	15-25μm	85-100℃	140-150℃	< 15 kg/m³	> 97%	
Medium	MD170D	Dry	Unexpanded	55-65μm	105-115℃	160-170℃	< 15 kg/m³	> 97%	
	MD175B	Dry	Unexpanded	18-25μm	120-130℃	175-190℃	< 15 kg/m³	> 97%	
High	HD180C	Dry	Unexpanded	25-35μm	135-145℃	185-195℃	< 15 kg/m³	> 97%	• HD180C, HD190B, HD190C are also available in masterbatch (MB) form.
	HD190B-1	Dry	Unexpanded	18-25μm	132-144℃	184-190℃	< 15 kg/m³	> 97%	
	HD190C-1	Dry	Unexpanded	26-40μm	125-140℃	185-195℃	< 15 kg/m³	> 97%	
	HD190B-2	Dry	Unexpanded	20-25μm	125-140℃	190-195℃	< 15 kg/m³	> 97%	
	HD190C-2	Dry	Unexpanded	26-40μm	120-135℃	190-200℃	< 15 kg/m³	> 97%	
	HD220B	Dry	Unexpanded	15-25μm	165-205℃	210-230℃	< 25 kg/m³	> 97%	
	HD220C	Dry	Unexpanded	25-36μm	165-205℃	210-230℃	< 25 kg/m³	> 97%	
	HD235B	Dry	Unexpanded	15-25μm	190-215℃	235-1245℃	< 60 kg/m³	> 97%	
	HD260B	Dry	Unexpanded	10-20μm	190-210℃	250-270℃	< 40 kg/m³	> 97%	

- **LD**: low temperature unexpanded dry powder; **LDE**: low temperature expanded dry powder
- **LW**: low temperature unexpanded wet powder; **LWE**: low temperature expanded wet powder
- **MD**: medium temperature unexpanded dry powder
- **HD**: high temperature unexpanded dry powder