



Company Profile

Zhejiang Castchem New Materials Co., Ltd is a Sino-US joint venture manufacturer who is engaged in producing STMMA copolymer resin beads for the pattern making in lost foam casting, it has been serving thousands of LFC foundries in China and abroad.

CASTCHEM is focusing on solving kinds of casting defects in lost foam casting for the customers. We have decades of experience both in white side and black side, which is able for us to provide suitable solution from the raw materials for the foundries.

Adhering to operation philosophy of "technological innovation, integrity and win-win", the company would like to cooperate with you for creating a more brilliant future based on "excellent equipment, leading development level, strict quality guarantee system, and win-win solution".

Expandable polymethyl methacrylate and styrene copolymer resin (STMMA), which is a copolymer in which methyl methacrylate is polymerized with styrene in a certain proportion (best ratio: 70:30 as currently recognized). It is milky white opaque beads, and its foaming agent is low-boiling point pentane. These foam beads are also the foam pattern material currently used by most lost foam casting companies around the world. Representative manufacturers of such foam beads: Japan's JSP (CL300-CL600 beads); Zhejiang Castchem New Materials Co., Ltd. (STMMA copolymers, including STMMA and STMMA-FD expandable copolymer resins). Among them, STMMA beads are not only used for castings made of gray cast iron and plain carbon steel, but are also particularly suitable for castings made of ductile iron, mild steel, alloy steel, copper alloy and stainless steel. STMMA-FD beads are mainly used to replace EPS beads and are used in producing lost foam castings made of medium and low-end materials such as gray cast iron, plain carbon steel and some ductile iron.

**Expandable Co-polymer STMMA and STMMA-FD**

(The lost foam casting foam-pattern-making raw material)

SPECIFICATIONS OF STMMA FOR LOST FOAM CASTING							
Chemical Hazard Class 9/ UN2211							
American Patent: US 6770 681 B2							
Product	Volatile level	Moisture	Beads size	Density	Suitable for	Blowing	Typical Applications*
Name	(by wt.)		distribution	suggest	castings with	agent*	
			peak(MM)		a minimum		
					thickness of*		
STMMA#1	≥ 7.0%	≤0.5%	0.85-0.90	18-20g/L	9.0mm	pentane	Ductile iron, carbon steel, and gray iron castings have hydraulic test requirements.
STMMA#2			0.65-0.85	19-21g/L	8.0mm		
STMMA#3A			0.50-0.65	20-22g/L	6.0mm		
STMMA#3			0.36-0.50	21-23g/L	5.5mm		
StMMA-FD#S	≥ 5.5%	≤0.5%	0.90-1.25	17-19g/L	9.0mm	pentane	Grey iron, Aluminum
StMMA-FD1B			0.71-0.90	18-20g/L	7.5mm		
StMMA-FD1M			0.60-0.71	18-20g/L	6.5mm		
StMMA-FD2			0.45-0.60	19-21g/L	5.5mm		
StMMA-FD3			0.35-0.45	21-23g/L	4.5mm		
* Density is a function of utilities and expander capabilities; the above values represent optimum expansion conditions.							
*The selection of bead size shall be according to the minimum thickness of the casting wall, used to be 1/10 of it. If the casting needs a high precision, it can also choose the next small class.							
*Contains an additive that quickly reduces the molecular weight of polystyrene at elevated temperatures.							
Formula Solutions:							
1.) STMMA series is focused on carbon rising defects in castings with fewer residues, low dissolution temperature.							
2.) The STMMA-FD series have great advantages in solving fold defects by aluminum casting and applications in iron castings to solve excessive lustrous carbon and porosity defects etc.,							



*Typical Application means we have tested in this kind of metal, metals beyond that are according to be actually used.

The Importance:

In the lost foam casting process, the foam pattern is very important. Choosing the suitable raw material for your foam pattern will decide the quality of your final castings.

We specially produce STMMA co-polymer resin beads for pattern making in lost foam casting, it has the below advantages compared with EPS:

- 1.) Reduces carbon defects in castings,
- 2.) Reduces lustrous carbon defects on the surface of steel/ductile iron castings
- 3.) Reduces smoke carbon and improves the surface finish of castings, to save the whole production costs.



*Notes: The above collector housing is made of STMMA by our customer in Europe.

The Advantages of Using the STMMA in Lost Foam Casting:

Decomposition and gasification chemical formula when pouring metal melt:

EPS: $C_8H_8=8C+4H_2$

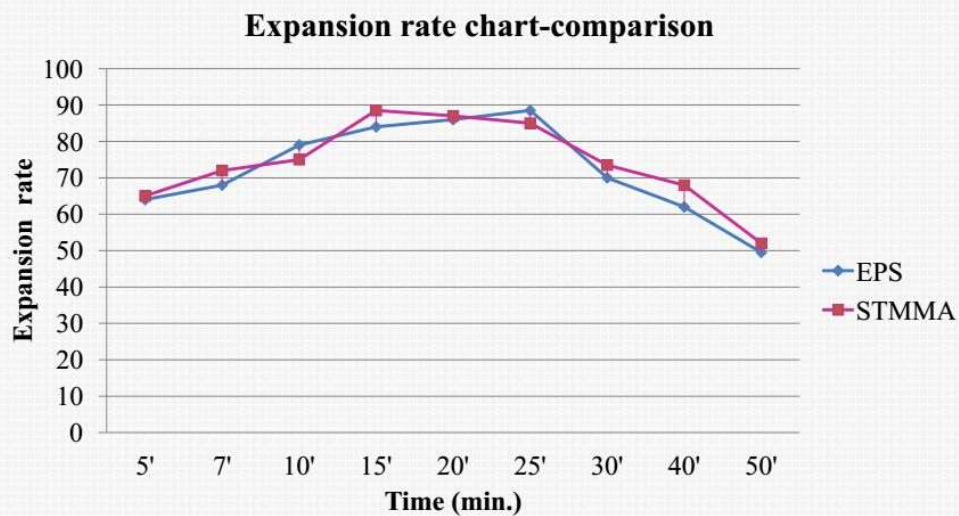
STMMA: $C_5O_4H_8=3C+2CO_2+4H_2$

1. The carbon content of STMMA is 62%, but the carbon content in EPS is up to 93%. STMMA will greatly reduce the lustrous carbon defects in the castings.
2. STMMA has a low pouring temperature, and gasification temperature generally 50°C lower than EPS. This will help the foundry to save energy consumption in \$50 to \$100 per ton of castings.
3. The molecular bonds are broken orderly when STMMA gasifies, accompanied by liquid low molecular residues. EPS molecules are disorderly broken, accompanied by tar-similar residues.
4. The high molecular weight of STMMA will reduce the pattern's dimensional shrinkage rate. Compared with the 220 thousand molecular weights, EPS has only 50 to 60 thousand molecular weights.



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Expansion curve graph on 105°C



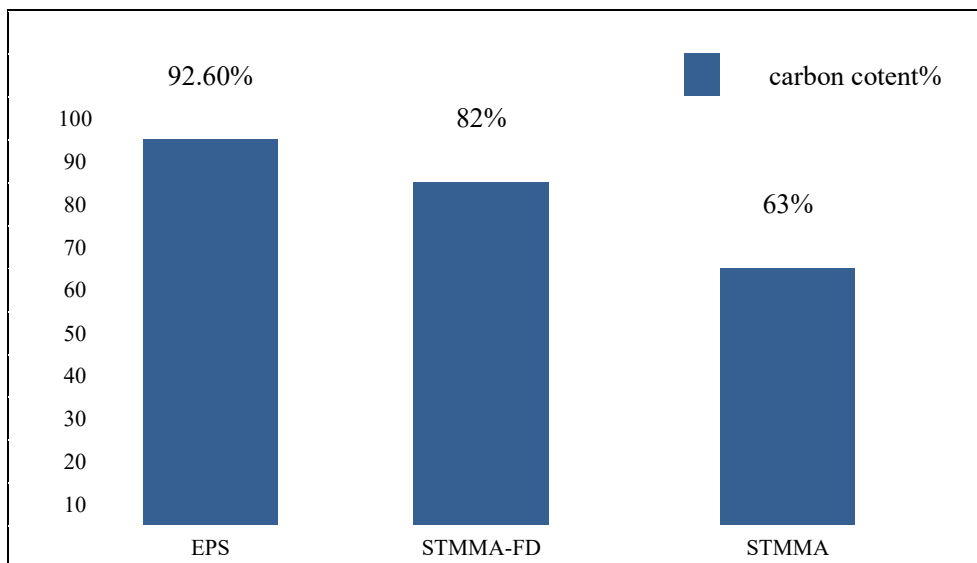
Burning





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The carbon content of EPS, STMMA, STMMA-FD:



The residue content after degradation of the foam pattern:

Item	Weight of pattern	Weight of residues	Percent of Residues	Density of pattern
EPS	3.37g	2.22g	65.90%	21g/L
STMMA-FD	3.37g	1.03g	30.60%	19g/L
STMMA	3.37g	0.15g	4.45%	20g/L

General Comparison:

	EPS	STMMA-FD	STMMA
Molecular formula	$(C_8H_8)_n$		$-(C_5O_4H_8)_m$
Carbon content	92%	82%	63%
Raw beads pre-expansion temperature	85~95 °C	85~95 °C	95~105 °C
Temperature of decomposition	912°C	900°C	700°C
Gas evolution of 900°C	600ml/g	700ml/g	900ml/g
Tapping temperature	1500~1520°C	1500~1520°C	1450~1470°C
End pouring temperature	>1470°C	>1470°C	>1420°C
Shrinkages of pattern dimension	0.3~0.8%	0.3~0.8%	0.1~0.3%



*Notes: We suggest you don't need to consider STMMA shrinkages when the pattern dimension is less than 300mm.

The molding process of STMMA:

Pre-foaming	Select beads	Select type of beads based on material and quality requirement of the casting, and select the size of beads based on the minimum wall thickness of casting.
	▼	
	Control density of pre-foamed beads	In order to give mold enough strength and rigidity, the resin beads to cast thin-wall pieces shall be controlled at density between 24~26g/L. Thick-wall pieces shall be made with large beads, with a density between 19~22g/L
	▼	
	Expansion of beads	Pre-heat temperature between 90~95°C, expansion temperature between 95~105°C, expansion time between 30~60s
	▼	
Aging	Aging of beads	The aging time depends on the environment temperature, humidity, moisture content, and density of resin beads. Aging is an important step for achieving a quality mold
	▼	
Pattern-marking	Preheating of molds	The purpose of preheating mold is to shorten the forming time and reduce condensed water in cavities during molding
	▼	
	Filling of molds	Fill with suction method, press method or both.
	▼	
	Heating(foam shaping)	The pressure shall be controlled between 0.2-0.3Mpa for heating steam. Pressure to be controlled between 0.11-0.14Mpa for autoclave forming, 0.10-0.12Mpa for the air chamber of the mold
	▼	
	Cooling	Cooling to form mold and give its strength and rigidity. Notes: cooling uniform and enough
	▼	
	Removing of molds	Shall prevent pattern surface from damage and deformation
	▼	
	Drying and stabilizing molds	Could be natural drying or drying in a ventilated room with a temperature controlled at 40-60°C, it must prevent the pattern from deformation. After drying, the moisture should be less than 1.0%