

## Porous Polymer Carrier Brochure

### Capatue™ PPC series

Porous Polymer Foam for Carrier Purpose

#### Abstract

Capatue™ PPC is the name given to porous polymer foam for carrier purpose, PPC stands for Porous Polymer Carrier. It is completely utilized the physical foaming technology and process, thus no chemical foaming agents were used and high purity can be achieved.

As the mixing with liquid additive is done at a room temperature, Capatue™ PPC is especially suitable for those thermally sensitive additives. When fully loaded with the liquid additive, the system remains dry and free-flowing.

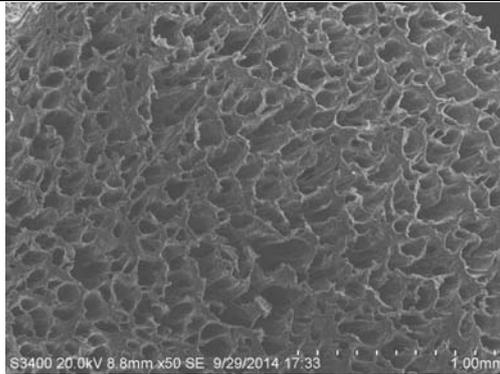


Capatue™ PPC offers the polymer processing industry an efficient, easy way to convert liquid or paste-like polymer additives especially for some thermally sensitive additives into dry, free-flowing pellets, needless to extrude.

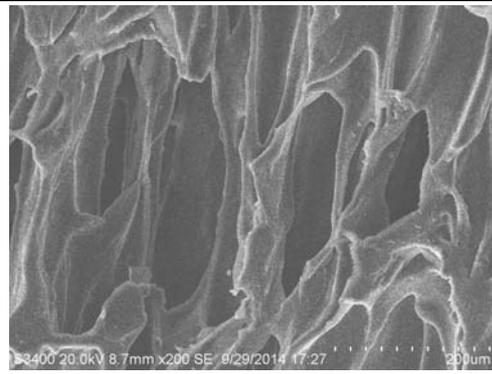
Microporous carrier Capatue™ PP can be used for the production of additive concentrates via physical adsorption of the additive. This product is most effective for the incorporation of liquid additives particularly when accurate dosage and homogeneity of the additive with the base resin is required.

#### Mechanism

PPC has an open cell structure with interconnected cells. The cell size distribution is roughly between 5 and 20  $\mu\text{m}$ . Depending on the polymer, the porosity ranges from 60 to 75% and the maximum additive loading from 30 to 70%.



SEM picture, transverse



SEM picture, longitudinal

Microporous structures of Capatue™ PP acts like tiny sponges with the ability to absorb several times their own weight. Loading of additives into a porous polymer is solely a physical absorption process. Due to capillary forces, the accessible porous structure will be filled with liquid additive.

When liquids or meltable solids are mixed with the porous polymer, the micron-size voids in the polymer are filled by capillary absorption. In these applications, the large inner surface of the Capatue™ PPC, with its accompanying adhesion forces, is utilized in combination with the cell and pore structure of the matrix to retain liquid within the polymer carrier. An additional advantage is the fine dispersion of the additive in the Capatue™ PPC structure which insures a homogeneous dispersion of the additive in the final product.

### Benefits

Although it is not cheap for MB industry compared to the regular extrusion process, but the following advantages are remarkable and unique:

1. **Room temperature handling and safety:** it is an ideal solution for those heat sensitive additives such as fragrances, organofunctional silanes, peroxides, maleic anhydride, anti-statics, antioxidants, coupling agents, antimicrobials, process stabilizers etc.
2. **High purity and high loading capacity:** a high concentrate masterbatch contains more than 50% active ingredients without any inorganic fillers like silica in it only by using PPC.
3. **Easy to handle and no requirements for expensive equipment:** even manpower and a PE bag could be used as the mixer.

## Applications

Capatue™ PPC opens a wide range of applications for thermally sensitive additives. The reloaded Capatue™ PPC is dry and free-flowing which makes them particularly suitable for the masterbatch addition technique. With its great help the additive will get a homogeneous dispersion in the final product.

PPC is most suitable for liquid, low melting, thermally sensitive, reactive or otherwise difficult to handle additives that cannot be processed by conventional extrusion compounding or masterbatching techniques.

Some typical application are including:

Organofunctional silanes, maleic anhydride, antioxidants, coupling agents, antimicrobials, fragrances, peroxides, process stabilizers and other performance additives are a few examples of additives that are routinely reloaded into PPC matrices.

Furthermore, agronomy technology (e.g. pesticide/fertilizer distributor) and cosmetic equipment (e.g. perfume/sent distributor) are also the potential application of our products.

## Grades

Grade	Appearance	Material	Additive Loading Capacity
PPC-HDPE	Pellet	HDPE	Up to 60%
PPC-LDPE	Pellet	LDPE	Up to 50%
PPC-LLDPE	Pellet	LLDPE	Up to 50%
PPC-EVA	Pellet	EVA	Up to 50%
PPC-PP	Pellet	PP	Up to 70%
PPC-PS	Pellet	PS	Up to 50%
PPC-ABS	Pellet	ABS	Up to 50%
PPC-PC	Pellet	PC	Up to 50%

Other grades like PET, PA, PMMA, SBC, PLA could be developed under request.

## How to use

The absorption rate is mainly determined by the viscosity of the additive. Depending on the viscosity the maximum additive loading may be achieved in 30 min or in 72 h.

### Requirements

1. If the additive is liquid at room temperature, loading can be done at room temperature.
2. If the additive is a solid or a paste with a melting point at slightly elevated temperatures, the additive can be melted and loaded at temperatures slightly above the melting point of the additive. However, the loading temperature has to be approx.

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40°C below the melting or softening point of the polymer, otherwise the porous structure might collapse.

3. If the additive is liquid but highly viscous at room temperature, the viscosity can be reduced in many cases by increasing the temperature. Again, the temperature should be approx. 40°C below the polymer melting or softening point.
4. The additive can be dissolved in an organic solvent (ethanol, acetone, IPA).
5. The viscosity of the additive should not exceed 30.000 cst.
6. Both hydrophilic/hydrophobic and polar/non polar additives can be loaded. In some cases the addition of wetting agents is required.

### Additive Loading and Equipment

Low speed and low shear mixers are recommended to use for the loading of additives into PPC. The purpose of mixing is to get a homogeneous distribution of porous pellets and liquid additive in the mixer and consequently equal additive loading on every porous pellet.

**High speed and high shear forces could damage the porous structure of the carrier and have no impact on the absorption rate of the additive.**

### Examples of mixers used for additive loading are

1. drum tumble mixer (200L drums)
2. tumble dryer (1~10m<sup>3</sup>)
3. Herschel mixer

### Parameters

1. mixer speed: 5~30 rpm
2. loading time: 30 min ~ 72 h
3. significant reduction of loading time with optional heating and vacuum system

For some special applications, please send email to our technical support team at [info@capatue.com](mailto:info@capatue.com) for advice.

## Processing Examples

### Example 1: Loading of Liquid Additive at Room Temperature

#### 50 kg batch with 40% additive content made with a drum tumble mixer:

1. Fill 30 kg PPC in a 200 liter drum at first.
2. Add 20 kg of the liquid additive.
3. Close the drum properly and tumble the drum at 5~30 tpm.
4. Open the drum after the specified loading time (has to be experimentally determined before) and check whether the additive is completely absorbed (the product is dry and free flowing) . If the product is still wet or sticky, the tumbling time has to be extended

accordingly.

If okay, the finished product can be taken out of the drum.

### **Example 2: Loading of Solid Additives at Elevated Temperature**

#### **50 kg batch with 50% additive content:**

1. Heat the mixer up to the required processing temperature.
2. Fill 25 kg of solid additive into the mixer and melt the additive.
3. Add 25 kg of PPC to the liquid additive. The PPC should be preheated to the same temperature.
4. Close the mixer and mix at low speed (5~30 tpm).
5. Open the mixer after the specified loading time (has to be experimentally determined before) and check whether the additive is completely absorbed (the product is dry and free flowing). If the product is still wet or sticky the tumbling time has to be extended accordingly.

If the finished product is dry and free flowing the mixer has to be cooled down to room temperature under continuous mixing.

If okay the finished product can be taken out of the mixer.

### **Packing**

The regular packing of this product is carton with PE liner (200kg net weight and 16 cartons for a 20 ft. container)) and paper bags with PE liner (10kg net weight).

### **Storage and Shelf Life**

Should be stored in dry, cool, ventilated room; keep away from water, moisture, high temperature and fire; keep the packing closed.

This product has a shelf life of at least 3 years from date of manufacture in the original packing and under a proper storage condition.

### **Further Information**

For transport, handling and first aid instructions, we refer to Material Safety Data Sheet (MSDS) for the Capatue™ PP which is available upon request.

### **Limited Warranty Information**

The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that Capatue's products are safe, effective, and fully satisfactory for the intended end use.

Suggestions of use shall not be taken as inducements to infringe any patent.

Capatue's sole warranty is that the product will meet the Capatue sales specifications in effect at the time of shipment.

Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

**Capatue specifically disclaims any other express or implied warranty of fitness for a particular purpose or merchantability.**

**Capatue disclaims liability for any incidental or consequential damages.**

**Customer must do enough tests before their regular production to ensure that our product is suitable for their specific application.**