THERMOPLASTICS

WITH EXPANDABLE MICROSPHERES

Create foams with closed cells and controlled cell size and excellent stability

OVERVIEW

Product Type
Unexpanded microspheres

Main Benefits
Controlled & stable foaming
Density control
Electrical insulation
Reduced weight
Thermal insulation

Applications
Automotive – Dashboard, steering wheel
Boards & sheets
Cables, gaskets & hoses
Modelling foam
Profiles
Seals – Car boots, doors & windows
Shoe soles & insoles
Technical cork
Wood plastic composite

Expandable Microspheres

Expandable microspheres can be used to produce **foams** with **excellent stability** in polymers with suitable melt properties and a processing temperature of 140 to 230ºC. Materials with a higher melt index are normally easier expand. Foams can be produced with **PE** (HD, LD, MD) PP (PP/EPDM copolymers), **PVC**, **PS**, **EVA**, EBA, TPE (SEBS, SBS), **TPO**, **TPU**, **TPV**. Thermoplastics filled with **glass fibre**, **wood fibre**, **nano particles** and **calcium carbonate** can also be expanded if the process takes place at a suitable temperature.

In thermoplastics, the microspheres offer a **closed** and **uniform cell** structure, **low density** at low additions, and electrical and thermal **insulation**. The spheres give **improved** compression set, improved drilling and sawing (wood plastic composite), improved sealing (gaskets) and narrow specification profiles **compared** to chemical blowing agents (**CBAs**).

Benefits of using Expandable Microspheres

For thermoplastics, **unexpanded microspheres** are available in variants to **suit** the form of the **polymer**. For polymers in **powder** form, dry, unexpanded microspheres should be used. If the polymer is in **granular** form, a masterbatch of dry, unexpanded microspheres compounded with a polymer carrier should be used. The **final density** of the thermoplastic is influenced by the amount of microspheres added, matrix type, matrix density, and process equipment.

Extrusion, **injection moulding**, **blow moulding**, **film blowing**, **rotational moulding** and **thermoforming** all work with expandable microspheres.

In **extrusion**, the spheres can easily expand to densities ranging from 0.015 to 0.025 g/cm3.

For **injection moulding**, typical densities are between 0.030 and 0.070 g/cm3.

In **blow moulding**, only very low pressures give an acceptable density reduction. In **film blown** applications, care must be taken not to rupture the film, and it is advisable to use microspheres with smaller sizes, starting with an addition of 1% w/w in masterbatch form. In **rotational moulding**, adding **1%** w/w of dry, unexpanded microspheres can reduce powder load by 15 to 25% while reducing cycle time and maintaining desired wall thickness.

Top Tips

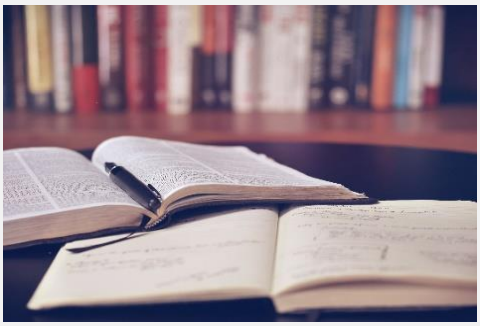
For extrusion and injection moulding

Extrusion

- Have good control over actual melt temperature, if temperature is too high for the chosen spheres they will start to collapse
- Low LD ratio, ideally 32, no vacuum/venting zone
- Use low shear screws; avoid using a melt pump or high shear mixing heads
- Use high rotational speed; high pressure prevents expansion in the barrel, a short retention time minimises risk of thermal degradation of the spheres
- Spheres expand all the way to the surface; a co-extrusion step may be needed for a glossy surface
- Increase haul off speed to compensate for volume increase of the profile; if this is not enough adjust the dimension of the die to get the correct dimension of the final product

Injection moulding

- Use a nozzle with a needle valve
- No after pressure to allow the expansion to fill the mould
- Optimise injection speed; a high speed gives fast filling of the mould which is desirable, but there is a risk of too much frictional heat
- Use a wide gate and shorter cycle time
- Cooling time can be reduced to the same extent that the weight has been reduced
- The screw should not be filled until just before the next injection



What's Next?

Further Reading

Our **Technical Guide – Expandable Microspheres** takes an in depth look at the properties of the spheres. A great introduction if you are new to the world of expandable microspheres.

Dry unexpanded microspheres are used to reduce the density and improve the foam structure of polyurethane microcellular foam, such as shoe soles. In model making materials and artificial wood, dry expanded microspheres are used in place of CBAs, find out why in **Application Guide – Expandable Microspheres in Modelling Board.**

For guidance on the best way to handle and mix Expandable Microspheres take a look at our **Technical Guide – Handling Expandable Microspheres**.

Do you need help **choosing the right grade** for your application, **more information** or a **sample** to try?

We are always happy to help and answer any questions you may have. Please do not hesitate to contact us:

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