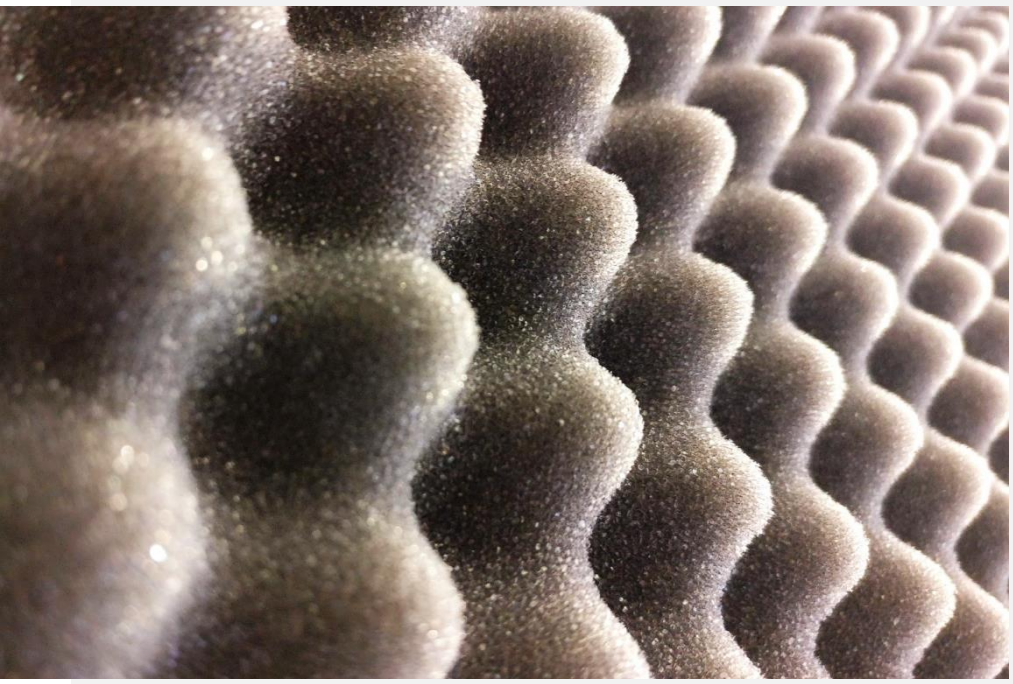
LIGHTWEIGHT FOAM

WITH EXPANDABLE MICROSPHERES

Make a uniform and closed cell foam entirely from expandable microspheres



OVERVIEW

Product Type
Expanded Microspheres
Unexpanded microspheres

Main Benefits
Controlled foaming with uniform cell structure
Good absorbance and recovery
Reduced weight

Applications
Helmet liners
Sandwich constructions
Sound insulation
Vanishing cast models
Vibration dampening

Expandable Microspheres

Expandable microspheres are made up of a thermoplastic shell encapsulating a hydrocarbon blowing agent. On heating unexpanded micospheres, their **shell softens** and the **surface** becomes **sticky**. The blowing agent generates **internal pressure**, **increasing** the **volume** of the spheres.

When a **mixture** of **unexpanded** and **expanded** microspheres are heated in a **closed mould** the combination of a sticky surface and an increase in volume fuses the spheres to give a **lightweight foam**.

A lightweight foam made purely of microspheres is firm, with a **uniform** and **closed cell** construction containing micro-sized voids, where the walls consist of very thin but stiff co-polymers.

While different **expanded** and **unexpanded** microsphere grades can be **used together**, it's important to remember the expanded microsphere grade chosen must be able to withstand the expansion temperature of the unexpanded microspheres.

Application Ideas

From helmet liners to vibration dampening

Mixing, Moulds & Heating

The **mixing ratio** of expanded and unexpanded spheres depends on the **desired density** of the foam. A lower density foam will need more expanded microspheres. The lower the density of the expanded spheres, the greater the volume and the lower the addition.

Aluminum moulds with thin walls give good transfer of heat to quickly heat the microspheres and **minimise process time**.

For best results, the **mould** should be **filled** with the **pre-mixed microspheres** to **90% capacity**. Quantity needed can be calculated by multiplying the volume of the mould by required density. Weight loss during heating is small and can be compensated for by increasing mixture quantity by 4 to 5%. The **mould** can be **heated** using a hot air oven, immersing in heated liquid or by **induction heating** for a **shorter process time**.

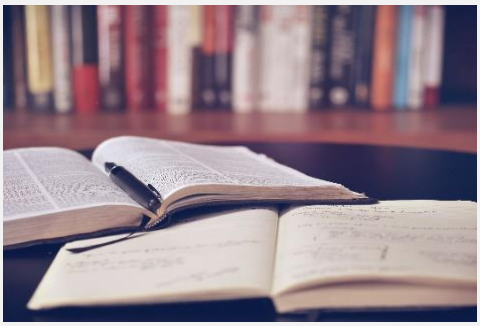
Foaming temperature and **time** depends on the unexpanded microspheres grade, mould type, heat source and foam thickness. For 40 µm polyacrylonitrile spheres, **temperature** is 185 to 195°C. **Time** for a 20 to 30 mm foam 10 to 30 minutes, The **mould** must be **cooled** to <60°C **before opening** to maintain dimensions and good stability by preventing collapse of the spheres close to the walls of the mould. This will also prevent over- or post-expansion, and the possibility of cracking.

In **helmet liners** have very good shock absorption and recovers permanently after deformation. The optimum shock absorption for light weight foams made purely with microspheres is at densities around 0.035 to 0.040 g/cm³. This makes weight reductions or reduced dimensions possible.

Sandwich constructions can be made high in stiffness and low in weight. The stickiness of the microsphere shell on heating creates good adhesion between the spheres and many different thermoplastics. The expansion temperature of the microspheres needs to match the softening temperature of the thermoplastic used.

The smooth and even surface, and dimensional stability of the lightweight microsphere foam makes it an ideal material for **vanishing cast models**.

To improve **sound insulation** and **vibration dampening**, cavities in closed spaces filled with a mixture of expanded and unexpanded spheres then foamed, can reduce noise and vibrations.



What's Next?

Further Reading

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

To discover how the microspheres are used as a foaming agent in materials such as PVC, TPE and TPU, take a look at our **Application Guide – Expandable Microspheres in Thermoplastics**.

For guidance on the best way to handle and mix dry expanded 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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