

POROUS CERAMICS

WITH EXPANDABLE MICROSPHERES

Make higher compressive strength porous ceramics,
faster, with greater control



OVERVIEW

Product Type

Expanded microspheres
Unexpanded microspheres

Main Benefits

Controlled & uniform pore structure
Cracking & deformation avoided
Easy & rapid burnout

Applications

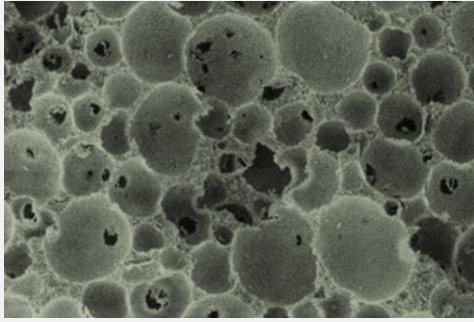
Absorbers
Dielectric resonators
Dust collectors
Filters
Hot gas collectors
Thermal insulation

Expandable Microspheres

Expanded microspheres can be used as a **pore former**, when making **macro porous** advanced and technical **ceramics** using the sacrificial template technique, Extrusion and gel moulding can also be used.

When compared to other substrates such as glassy carbon, solid polymers, or starch, the microspheres contribute **less organic material** to **burn out** per pore volume. Expanded microsphere grades used are vinylidene chloride (**VDC**) **free**.

The **burnout process** can be significantly **accelerated** **without** creating **stress, warping, or crack** formation. This **improves** the **compressive strength** of the finished product.



Extrusion & Gel Casting

Expanded microspheres can be used in the **extrusion** of ceramic articles.

Care has to be taken when using extrusion techniques since high pressure and high shear forces can destroy the microspheres. This results in a loss of porosity.

Unexpanded microspheres are used in **gel casting**.

When the gel is formed by heating the monomer and cross-linking agent, the microspheres expand to shape the pores.

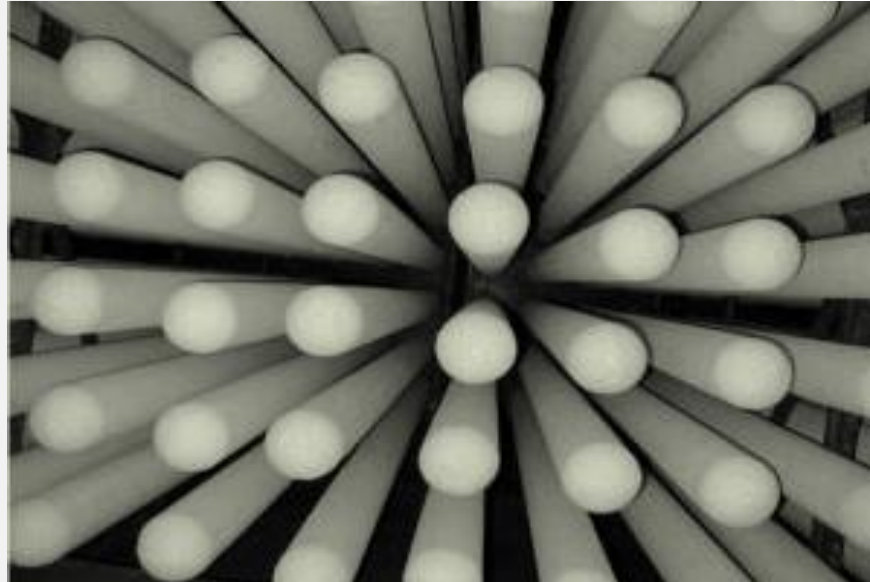
A homogeneous and high strength porous ceramic is created.

The gelation temperature and the expansion temperature of the microspheres need to be modified to start together. Various shapes can be cast and sintered with fine surface details.

When using **expandable microspheres**, the **sacrificial template** technique is the most commonly used method to produce advanced and technical porous ceramics.

Sacrificial Template

Advantages when using expanded microspheres



Using expanded microspheres as sacrificial templates gives a **fast** and **easy** burn out as the expanded microspheres contribute with a **large pore volume** at **low organic content**.

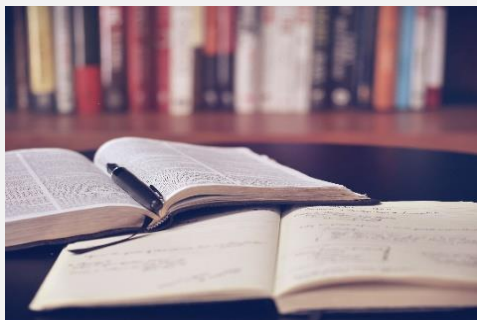
The **carbon dioxide release** for expanded microspheres is approximately **20 times lower** than glassy carbon.

The burnout and release of carbon dioxide takes place at a **wider temperature** window compared with glassy carbon.

The **de-binding** cycle can therefore be significantly **shortened**, while still avoid cracking and deformation, giving **higher strength** porous ceramics.

Density reduction, **pore size** and pore size **distribution** can be controlled.

It is important to ensure good ventilation as toxic gases are released from decomposition of the polymer shell during the combustion.



Further Reading

A greater technical insight into the benefits and properties of using expandable microspheres in porous ceramics can be found in our **Technical Guide – Porous Ceramics with Expandable Microspheres**.

Our **Technical Guide – 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.

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

What's Next?



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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Something to Note

The information contained in this guide is a result of our experience and research. It is given in good faith but under no circumstances does it constitute a guarantee on our part, nor does it hold us responsible, particularly in the case of legal action by a third party.