

⇒ Microspheres produced from molten materials (inorganic, organic, alloys and polymers) can be used for dosing, proportioning, compounding, coloring, and light stabilization. Microspheres with dissolved or embedded active agents, with or without coating are used for numerous pharmaceutical and cosmetic products.

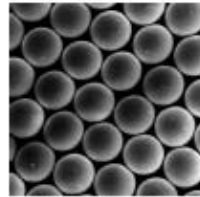
⇒ Soluble chemical compounds can be incorporated into Microspheres by precipitation for use in agricultural, food, pharmaceutical and cosmetics industries.

⇒ Suspensions are used to produce Microspheres with embedded enzymes or bacteria.

⇒ With our special double nozzle systems Microspheres with encapsulated materials can be obtained. Especially for the encapsulation of water, aqueous solutions or cells, a microsphere with a liquid core and a solidified shell can be produced. The shell and the core material can be chosen as appropriate, e.g. alginate, PVA, PEI, PEG, wax, metal oxides, gelatin, hydroxylcelluloses etc.

⇒ Mixing nozzle systems that allow mixing of agents are suitable to produce polymers by mixing the monomer with the catalyst "on time".

The finished Microspheres can be modified by subsequent washing, further chemical reactions, drying, calcining, sintering, impregnation, coating, coloring, sorting ...



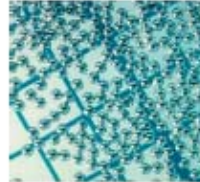
SEM image of SiO₂ Microspheres



Filtering material out of Al₂O₃ with additives



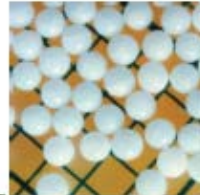
Metal alloys for metallurgical and electronic applications



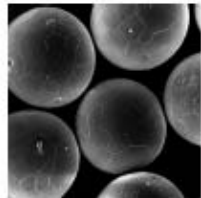
Pharmaceuticals embedded in Alginate for cosmetic use



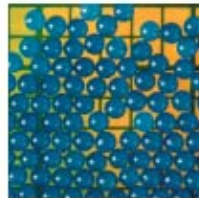
Pharmaceuticals embedded in wax



Colored polyethylene

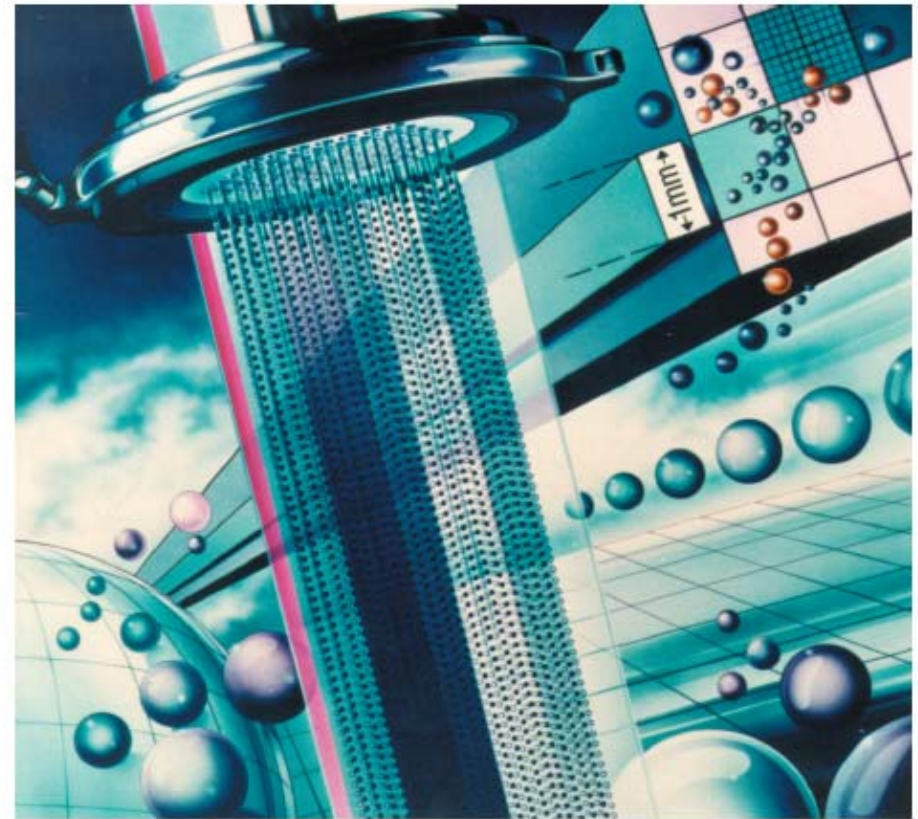


SEM image of metal oxide Microspheres



Wax embedded liposomes

Microspheres Technology and applications



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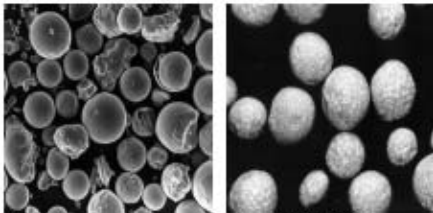
Powders and Granulates

Free-flowing powders and granulates are needed for a variety of industrial processes. These, however, do not always meet the exacting standards which modern manufacturing demands of them due to their varying grain size distribution and odd shapes.

These properties are detrimental to efficient processing and lead to agglomeration, inexact dosage, abrading with loss of material or low reproducibility of castings.

Pharmaceutical applications require highly reproducible dosage and the controlled release of active agents and this can not be achieved with conventional powders and granulates.

Powders manufactured by:



Spraying

Dispersion in liquids

The Answer to these Problems

The use of small and perfectly round microspheres with exactly the same size circumvents all of the disadvantages that are encountered while using powders and granulates. These microspheres are free flowing and roll with practically no friction, that means there is no abrasion, guaranteeing a dust free environment. Pharmaceuticals embedded in the microsphere matrix are released continuously and at a constant rate.



Monodisperse alumina microspheres

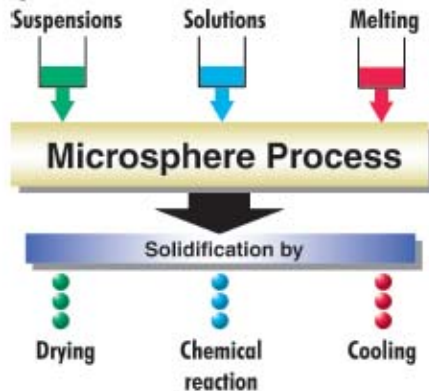
Ultra Spherical Microspheres

Microspheres with a monodisperse grain size distribution and the smallest divergence are manufactured by BRACE:

- ⇒ perfectly spherical Microspheres
- ⇒ monodisperse grain size, narrow size distribution with diameters between 50 µm and 5000 µm
- ⇒ non abrading, therefore dust free
- ⇒ free flowing, porous, large surface area, soft or rigid
- ⇒ for embedding pharmaceuticals, biomass (e.g. yeast or enzymes) or other heterogeneous catalysts with or without coating.

The Process

A liquid is gently pumped through a vibrating nozzle system where upon exiting the fluid stream breaks up into uniform droplets. The surface tension of these droplets moulds them into perfect spheres in which gelation is induced during a short period of free fall. Solidification can be induced in a gaseous and/or liquid medium through cooling, drying or chemical reaction. There are no constraints on the type of liquid - i.e. molten materials, solutions, dispersions, sols or suspensions can be used to manufacture perfectly spherical microspheres.



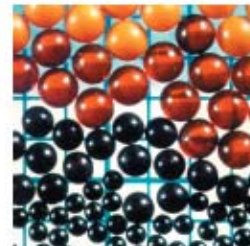
Types of Production Facilities

BRACE designs, constructs and installs microsphere production units according to customer needs. BRACE stocks a series of standard microspheres and is able to produce microspheres according to customer specifications. In surplus the development of new encapsulation processes, enhancement of recipes or targeting new markets - from initial small scale up to full production and OEM manufacturing of spheres - is done by BRACE.

Processing Characteristics

Microsphere production units have a minimal space requirement (15 to 40 sqft/1m²), the energy consumption is very low and they are noiseless during operation. These units operate at atmospheric pressure or slightly above and can be designed to be explosion proof and/or according to the GLP/GMP guidelines. Microsphere production units from BRACE need practically no maintenance, therefore only a minimal staff is required.

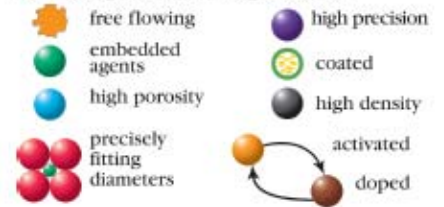
Units are delivered with automated controls and can be delivered as remote controlled and enhanced solutions.



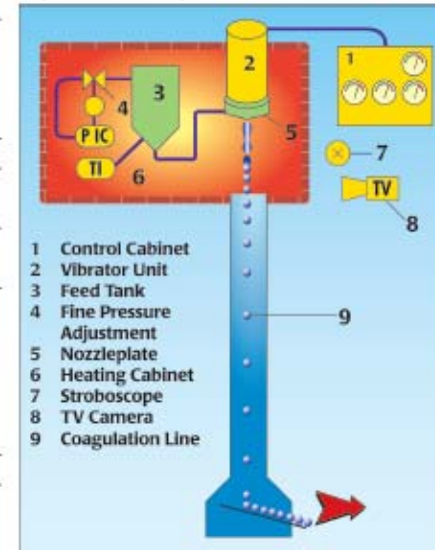
Metal oxide spheres as moulded (yellow), dried (yellow transparent), calcined (black) and sintered (black, smallest). The shrinkage in diameter corresponds to their solid content during sintering.

Types of Microspheres

There are very few restrictions on the types of microspheres that can be produced. With the right combination of liquid precursor, the solidification process and subsequent treatments, a wide range of microspheres can be produced.



⇒ Dry metal oxide microspheres



Fusion Process

produced on the basis of a sol (Al₂O₃, ZrO₂, HfO₂, TiO₂, CeO₄, SiO₂, and mixed oxides) can be used as highly sinteractive press-feed for the production of high-tech ceramics. Through calcining the pore size and surface area of the microspheres can be tailored to within exacting specifications.

These microspheres make excellent catalyst

carriers, homogeneous catalysts or filtering materials. Unusually effective and abrasion resistant microspheres for grinding other materials are made from sintered Al, Zr, and Hf-oxides.