Synthesis and Properties of Microparticles

Synthesis of MF-polymer particles

Monodisperse melamine resin particles are a new class of polymer particles with excellent physical and chemical properties. In contrast to the synthesis of polystyrene particles, melamine resin microspheres are manufactured by hydro-thermal acid-catalyzed polycondensation of methylol melamines in the temperature range 70-100 °C without any surfactants. By varying the concentration of methylol melamine, pH-value, or temperature, mono-disperse particles with diameters from 0.1 to 20 mm can be produced in a one-step process and in a predictable way according to the reaction scheme.

As a result, the MF-particles possess many functional groups on the surface (methylol groups, amino groups), which can be used for a covalent attachment of biological ligands (antigens, antibodies, enzymes). Because of the high density of polar triazin-amino and imino groups MF-particles have a hydrophilic and charged surface. For special applications, the MF-polymer particles can be modified by incorporation of other functionalities such as carboxyl, hydroxyl, or sulfhydryl groups. Hence, the particle surfaces can be subjected to further chemical derivatization reactions.

The main advantages of MF-Polymer particles are the following:

- high monodispersity and uniformity (C.V. : 1-2%)
- spherical shape
- hydrophilic surface
- high temperature resistance up to 300 °C
- high cross-linking density
- superior mechanical stability (pressure stable)
- extremely high resistance in all organic solvents
- no swelling in organic solvents
- excellent long time stability/ sterile in aqueous solvents without toxic additives
- Freeze - thaw stability in water
- can be dried directly from aqueous phase and resuspended
- density of 1.51g/cm3
- refractive index of 1.68
Synthesis and Properties of Monodisperse Polystyrene Microparticles (PS-Particles)

Synthesis of PS-polymer particles

Aladdin presents a wide variety of monodisperse polystyrene nano- and microspheres (PS) with well-defined size and surface properties. These particles can be manufactured either by conventional emulsion polymerization, surfactant-free polymerization or by seeded-growth polymerization of styrene in aqueous solution with potassium persulfate as a convenient polymerization initiator.

Under suitable reaction conditions, monodisperse spherical polystyrene particles in the 0.1 - 3 mm size range can be obtained in a single step. The particles possess negatively charged sulfate endgroups on the surface arising from the decomposition of initiator molecules. It is also possible to manufacture polystyrene particles with other functional groups on the surface (carboxyl-, aldehyde-, and amino groups). By copolymerization of styrene and functional monomers tailor-made particles of the core-shell type can be prepared.

A new method has been developed for the synthesis of polystyrene polymer particles in the size range from 10 to 1000 mm.

Important properties of these PS-particles are the following:

- high monodispersity and uniform spherical shape
- hydrophobic surface
- non-specific adsorption of proteins
- low temperature resistance up to 100 °C
- soluble in organic solvents (dependent on the degree of cross-linking)
- swelling in organic solvents
- density of 1.05g/cm³
- refractive index of 1.59

PS-particles are typically used for calibration purposes and immunoassays (latex agglutination test, FACS). Many of the tests are based on non-covalent binding of specific antibodies, antigens or cells to the hydrophobic particle surface. Covalent attachment of proteins to surface modified particles is possible.

Synthesis and Properties of Monodisperse Poly(methyl)methacrylate)-Microparticles (PMMA-Particles)
On request it is also possible to synthesize monodisperse spherical PMMA-particles in the 0.1 - 10 mm size range. Important properties of these particles are the following:

- extremely narrow size distribution
- hydrophilic anionic surface
- good mechanical stability
- good biocompatibility
- density of 1.19 g/cm³
- refractive index of 1.48

PMMA is reported to have a reduced non-specific protein binding activity. The higher density of 1.19 g/cm³ provides a heavier particle than polystyrene and allows more rapid separation.

For More information on related products, please visit www.aladdin-e.com

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