OptiLink® Carboxylate-Modified Microparticles

Product Description: Seradyn OptiLink® carboxylate-modified polystyrene microparticles (CM-MPs) are uniform, colloidally stable, monodisperse spheres made by the free radical emulsion co-polymerization of styrene and acrylic acid. Colloidal stability, defined as maintaining separate particles, requires a minimum amount of negative surface charge. Negative charge supplies a repulsive electrostatic force to counteract the inherent attractive van der Waal's force. The negative charge arises from sulfate groups which terminate the polymer chains, adsorbed surfactant from the polymerization, and acrylic acid carboxyl groups. Emulsion polymerization yields particles composed of high molecular weight chains. The MPs consequently have good physical integrity and no "fines" (particle fragments).

The particles are normally supplied at a nominal 10% solids after dilution with deionized water from the original polymerization mixture The 10% suspension will contain approximate percentages:

1. Microparticles	10%
2. Inorganic salts	~0.05%
3. Soluble polymer	~0.3%
4. Free detergent	~0.15%
5. Water	~90%

Seradyn manufactures microparticles under strict quality and GMP controls in our FDA medical device registered, ISO-13485 certified facility.

Processing: A sample of each batch is taken for complete characterization. The remainder is diluted with deionized water, bottled, pasteurized, sealed, and refrigerated to prevent contamination. Special antimicrobial processing such as the addition of sodium azide is available at additional cost.

Cleaning: Some buffer salts, soluble polymer, and free detergent may be present in the aqueous phase after polymerization. Surfactant molecules adsorbed onto the surface of the particles contribute to colloidal stability. CM-MPs can be cleaned by ion exchange, membrane filtration, or centrifugation.[1] For most purposes, the CM-MPs can be used without further treatment. In-house data demonstrates that our proprietary surfactant does not interfere with protein binding.

Characterization

Physical: The CM-MPs can be diluted in short-chain alcohol-water mixtures, dilute acids or bases, and some organic solvents.[2] Solvents such as ketones (e.g. acetone or methylethyl ketone) or non-polar organic solvents (e.g. toluene or benzene) should be avoided.

Diameter: The microparticle diameter is routinely measured by quasielastic light scattering (QELS) and a standard deviation of the diameter is provided. If QELS is used, a dispersity parameter is obtained which provides an index of uniformity. Diameter is reported in micrometers, μM. Particles with diameters over 1μM may be measured by other methods such as a Coulter Multisizer or Zone Electrophoresis.

Carboxyl Content: Carboxyl content is determined by conductometric titration with NaOH of ion exchange resin cleaned microparticles. Carboxyl content is reported in milliequivalents of carboxyl per gram of CM-MPs (mEq/g), and Parking Area (PA). PA is the calculated surface area per carboxyl group. Note that a high PA number denotes a low surface density of carboxyl groups. PA is given in units of angstroms squared, $Å^2$.

% Solids: Microparticles are usually packaged at 10%. The % solids is measured by drying to constant weight and is reported in g/100g.

Microbial Content: Seradyn microparticles are tested for bacteria and fungus contamination using standard microbiological techniques and reported as colony forming units per milliliter (cfu/mL). Unless otherwise indicated, all particles are either pasteurized or packaged with 0.05% sodium azide.

Stability: Particles should be stored at 2-8 °C. DO NOT FREEZE. Freezing may cause irreversible aggregation. Particle settling is determined by a combination of diameter and surface charge. Microparticles with diameters greater than about 0.4 μM settle at an appreciable rate. If particles are

settled, resuspend by swirling, rolling, or sonication. Avoid producing foam.

Protein Coupling: Proteins may be bound to CM-MPs by adsorption or covalent coupling. Adsorption is mediated by hydrophobic and ionic interactions between the protein molecules and the surface of the MPs. A recommended binding buffer is 50 mM MES buffer, pH 6.1. Under these conditions, protein binding to CM-MPs is higher than to polystyrene MPs.[1]

Covalent coupling to CM-MPs may be performed with very simple and effective protocols.[1] Washing, to remove unbound protein, can be accomplished by centrifugation or membrane filtration. If centrifugation is used, the microparticle pellet can be quickly and easily resuspended by probe sonication. Seradyn's Microparticle-bound Protein Assay[1] allows the direct measurement of both total and covalently-bound protein.

Miscellaneous Polystyrene Values:

Specific gravity	1.05 g/mL [2]
Refractive index	1.59 at 589 nm 25 °C [2]

References:

1. Microparticle Reagent Optimization, Seradyn, Inc.
2. Polymer Handbook 3rd Ed., ed. by Brandrup & Immergut, 1989

Notes:

1. The drying of microparticles around the rim of the container can occur during handling and processing. If dried microparticle residue falls into the container, it can be easily removed by filtration.

2. For particles of diameters greater than about 0.6 µM and with parking areas greater than about 100 Å^2, the addition of sodium azide may decrease colloidal stability. This can cause increased clumping and difficulty in resuspending microparticles.

3. Color-Rich® or Fluoro-Max™ dyed particles are made by dyeing OptiBind™ polystyrene or OptiLink™ carboxylate-modified particles with proprietary dyes. These particles are normally packaged at 2.5% solids to prevent clumping on storage.

DCR5685

OptiLink® Carboxylate-Modified Microparticles Certificate of Analysis

Revised:

Catalog No.	73003420100250
Material:	CM: Carboxylate Modified Polystyrene
Mfg. Lot No.	501608
Package Lot No.	902696
Diameter (µM) / Method	3.098/MULTI
Std. deviation (µM)	0.281/MULTI
Carboxyl content (meq/g)	0.0221
Parking Area (Å^2)	14
% Solids (g/100g)	10.1
Bacteria / Fungus (CFU/mL)	0/0
Sodium azide (%)	0.05

Customer Specific Requirements	
N/A	N/A
N/A	N/A

By: C Burger Date: 10/29/09

Revision H

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