

SphereMAG[®]

High Quality Magnetic Polymer Microbeads

Background

Liquids Research Ltd is a world leading manufacturer of ferrofluids for engineering applications. We have used our particle production and dispersion technology to produce a range of magnetic polymer microbeads with average sizes from 0.1µm to 1µm. The initial ferrofluid is produced aggregate free by ultra-filtration giving a uniform particle loading in each bead.

The <1µm beads have a 50% weight magnetic loading. The 1µm beads having either a 40% or 60% loading. The magnetic loading is measured using a vibrating sample magnetometer rather than the iron content which gives an over estimate.

The surface level of COOH is comparable to or better than those of our competitors, determined via a titration method. At present all materials are functionalized with COOH groups. Amine functionalized beads will be available later this year.

The size range and distribution is measured via SEM.

Sedimentation is similar to or better than those of competitor products and gravitational stability is of the same order.

All products have been pasteurized and filtered.

Packaging and Pricing:

Prices are generally lower than competitors. All our products are available in 1ml quantities, with discounts available for 5ml and 10ml. For guaranteed regular orders we are able to offer additional discounts.

A free 1ml sample of one product is available on request.

Products:

Code	Mean Diameter	COOH Content (µeq/g)	wt% Solids	wt% Magnetic
SM1 40	1.0µm	150-200	10	40
SM1 60	1.0µm	250-350	10	60
SM.1 50	0.1µm	100-200	10	50
SM.2 50	0.2µm	175-225	10	50

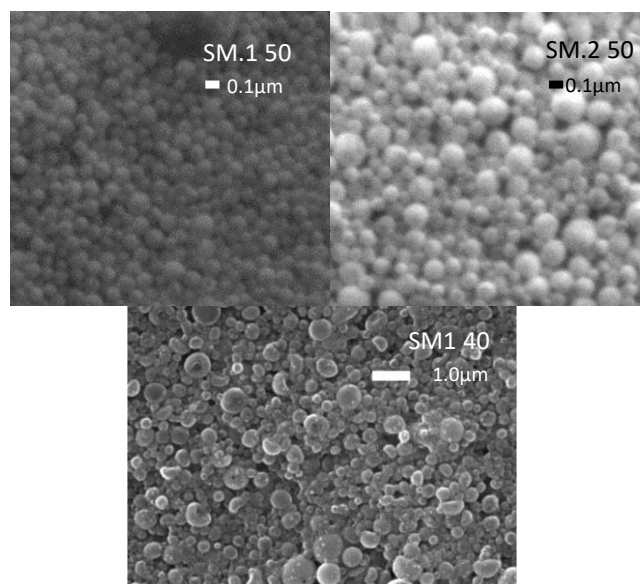
Our products are similar to competitor materials and effective for applications where COOH functionalisation is required.

The COOH content is similar or slightly higher than our competitors products due to the improved dispersion of magnetic material within the polymer beads.

The degree of COOH functionalisation increases with greater magnetic content.

Sample Images

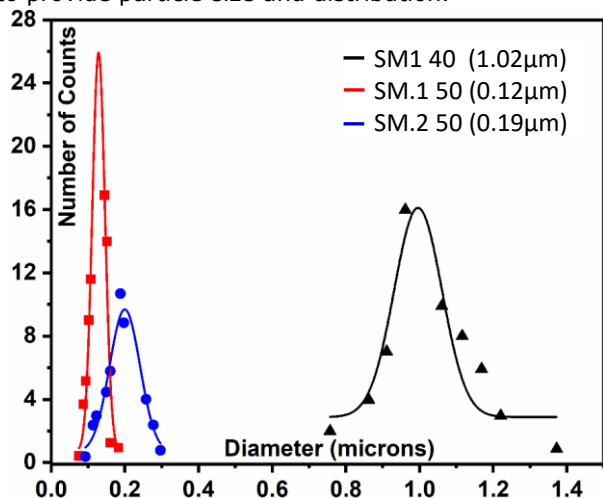
The images below were taken with a JEOL 7800 Prime SEM at a magnification of x30,000.



The beads are uniform with a size range within 30% of the mean. Mean values are determined over 100 beads taken randomly.

Size Distributions

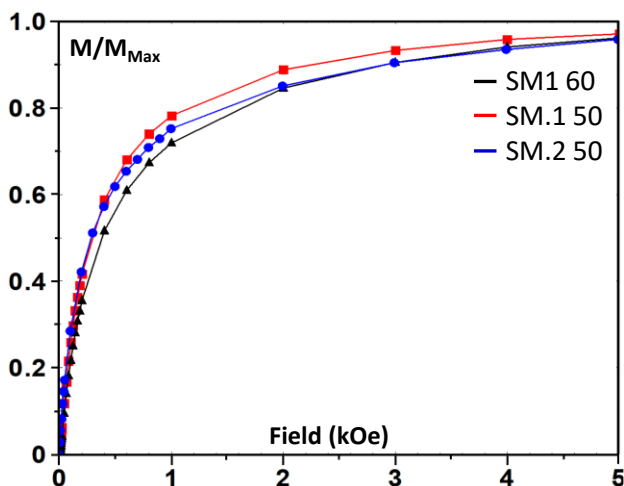
Polymer bead sizes were measured using a Zeiss Particle Size Analyser. The mean size was measured using over 100 particles. Custom software was used to provide particle size and distribution.



Magnetic Content Determination

The magnetic content was measured using a Lakeshore Model 7400 series VSM calibrated against a Palladium standard. Samples of beads were dried at 80°C overnight and the magnetisation measured at a field of 9kOe (716 kA/m). This method is preferable to chemical analysis of the iron content as the surface atoms in nanoparticles are not magnetically ordered giving an overestimate of the magnetic content.

Measurements in the liquid state show that the beads are superparamagnetic, i.e. show no hysteresis, even after exposure to a magnetic field following brief ultrasonification.

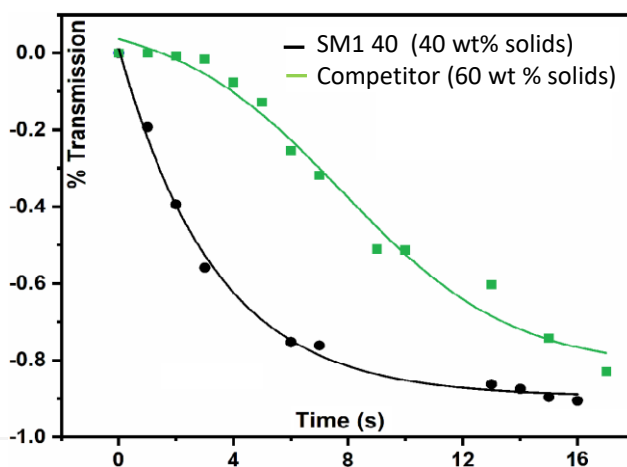


Surface Carboxyl Determination

The degree of surface functionalisation was determined by conductometric titration. The beads were suspended in water, after being washed with 0.01M HCl to remove residual charged species. The particles were titrated against 0.01M NaOH, following the method of Kong *et al*, Cent. Eur. J. Chem., 2008, 6(4), 627.

Sedimentation Rates

Sedimentation was determined by light absorption. Samples were placed in a 10mm cuvette over an NdFeB magnet. The magnetic field gradient was 128 Oe/mm 20mm from the bottom of the cuvette.



Applications

Our microbeads are suitable for a large range of applications including protein separation and cell isolation. Our microbeads are particularly useful in chemiluminescent immunoassays (CLIA). Our products are compatible with all magnetic cell separation techniques.

Quality Assurance

Each batch of SphereMAG® is individually characterised and supplied with a certificate of analysis (CoA) and a safety data sheet.