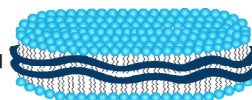


PRODUCT DATA SHEET

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SMA Universal with pH-Selector™

Lipodisq™ Styrene:Maleic Acid Copolymer Universal SMALP+pHS™



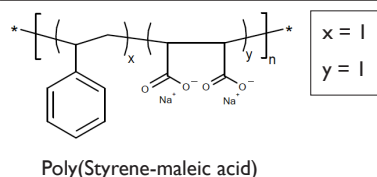
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Synonyms

Lipodisq™ Styrene:Maleic Anhydride Copolymer Universal (pre-hydrolyzed) with pH-Selector™, [uSMA with pH-Selector™], P(SMA) with pH Selector™

Empirical Formula



Molecular Formula

$C_{12}H_{10}O_4Na_2$

Size

100mg size includes 0.5ml pH-Selector™ and 500mg size includes 2.5ml pH-Selector™

MW

Polymer MW average: M_w : 5,500 M_w : MW based on weight / M_n : 2,100 M_n : MW based on number

CAS

26762-29-8

Purity

>98%

Solution pH

4.5 to 8.5 in 5% ddWater depending upon the addition of pH-Selector™

Solubility

Soluble in water, and buffer solutions (pH 4.50-8.50) to allow the formulation of a proprietary, thermostable, aqueous lipid nanoparticle (Lipodisq™, Malvern Cosmeceutics Ltd., Malvern UK). uSMA with pH-Selector™ has overcome the limitations using divalent ions or narrow, defined pH ranges usually an inherent property of P(SMA), which can cause P(SMA) precipitation or interfere with SMA-Lipid Particle formulation or stability. Compatible with Ca^{++} (10mM) or Mg^{++} (30mM).

Formulation with Phospholipids

Lipodisq™ are nanosized lipid-based discoidal particles that can be produced with P(SMA) and lipids such as DMPC (1,2-Dimyristoyl-sn-glycero-3-phosphocholine) (14:0 PC) (DMPC: IAX-700-400) to incorporate hydrophobic, poorly water-soluble active compounds, such as peptides, lipids, lipoproteins, transmembrane proteins and glycolipids. Applications of Lipodisq™ include functional and structural characterisation of the embedded cargo, drug delivery with enhanced bioavailability, or extended biological half-life *in vivo* (PD/PK) and delivery of antigens maintained in their native conformation for immunization purposes.

Appearance

White powder

Handling

Keep dry. Avoid skin and eye contact.

Shipping

Ambient

Storage

2-8°C or 15-25°C

Stability

Upon receipt, store product at ambient temperature. Freezing is not recommended. In its unopened original vial, the product is stable for at least 36 months when stored at ambient temperature. Once the glass vial is opened, or solubilized in sterile, endotoxin-free ddWater (IAX-900-902) or in pH-Selector™ or buffers and aliquoted into sterile vials under sterile conditions, the SMA polymer solution (e.g. at 5%) remains stable for at least 1 month when stored at 2-8°C and kept sterile.

MSDS

Available on request

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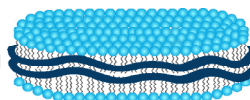
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SMA Universal with pH-Selector™

Lipodisq™ Styrene:Maleic Acid Copolymer Universal SMALP+pHS™



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Lipodisq™ Styrene:Maleic Acid Copolymer / P(SMA) System: Introduction

- A nanoparticle (11-40nm) drug delivery system comprising a discoidal phospholipid bilayer membrane stabilised by a chaperone molecular annulus.
- All components are batch tested for Lipodisq™ formation using validated buffer systems, which are assessed by Dynamic Light Scattering (DLS) to confirm nano-formulated drug characteristics. The buffer solutions themselves are endotoxin tested and supplied sterile.
- Lipodisq™ formation is highly efficient and shows a good safety profile, suitable for in vitro and in vivo (in experimental animals) investigations.

Enables membrane proteins (MP) to be reconstituted within phospholipid membrane mimics without the use of mediating detergent. Nanodiscs formed from SMA are also referred to as styrene maleic acid lipid particles (SMALP). SMA-lipid particles are formed by directly extracting membrane proteins either from native cellular membranes (giving native nanodiscs) or from an intermediary MP-reconstituted synthetic membrane system to ultimately form self-assembled discoidal nano-structures of a general diameter of 10–12 nm.

Universal Lipodisq™ Styrene:Maleic Acid (uSMA) with pH-Selector: Unique Advantages

- uSMA requires only a single polymer grade to be used, avoids the need to select several SMA grades that each operate only over a narrow pH range
- uSMA can be tailored to operate over a wide pH range 4.5-8.5 by simple addition of standard quantities of pH-Selector™
- uSMA is insensitive to presence of divalent cations, Ca²⁺ (<10mM) and Mg²⁺ (<30mM), suitable for use with ion pores, ABC transporters and ion sensitive GPCR assemblies
- uSMA can be modified to form larger particles, reducing direct interactions between the polymer chaperone and membrane-bound proteins

The ability of SMA to create monodisperse nanodiscs covering a range of particle sizes facilitates the reconstitution of oligomeric MPs and MP complexes for analysis by various methods including fluorescence microscopy, NMR and single-particle cryo-EM. Lipodisq™ technology is a proprietary technology developed by Malvern Cosmeceutics Limited and is subject to granted international patents. See: <http://lipodisq.com>.

Lipodisq™ Procedure Overview

- As a starting point use a ratio of 2.5:1 (w/w) for P(SMA)/SMA polymer and phospholipid, such as 100mg P(SMA)/SMA polymer and 40mg DMPC. Prepare 5% (w/w) uSMA in deionized water. Adjust the solution with the corresponding volume of pH-Selector (see table) and confirm the pH.
- Prepare a 2% (w/w) aqueous phospholipid emulsion in deionized water. Incorporate hydrophobic drug candidate/peptides/transmembrane proteins (MP) at up to 0.2% (w/w)
- This mixture is stirred at temperatures above the phase transition temperature of the lipid (>24°C for DMPC), before aqueous P(SMA)/SMA polymer at 5% is added drop-wise until an approximate volume ratio of 1:1 is reached and the lipid emulsion clears.
- Alternatively, P(SMA)/SMA polymer solutions containing the pH selector™ at the selected pH are mixed with native (cell or bacterial) membranes to form native nanodiscs.
- Stirring time, pH, selected buffer type and strength (e.g. HEPES, NaCl, TRIS or PBS with or w/o Ca⁺⁺ and Mg⁺⁺), pH-Selector™ and temperature of the phospholipid emulsion containing the MP or active agent, need to be optimized.
- Purification of formed Lipodisq™ can be achieved by ultracentrifugation at >100,000 x g to remove residual lipid and excess P(SMA)polymer or a size exclusion column (SEC) can be used.

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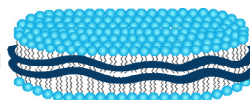
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	pH 4.0	pH 5.0	pH 6.0	pH 7.0	pH 8.0	* System compatibility confirmed with PBS, TRIS, HEPES buffers and aqueous conditions at pH 7.0 with 120µl pH-Selector™. Tested maximal divalent ions tolerance for Mg ⁺⁺ <30mM, Ca ⁺⁺ <10mM. NaCl compatibility confirmed at 150mM.
Catalogue No.	Quantity	Quantity	Quantity	Quantity	Quantity	
IAX-700-205-M100 uSMA	100mg	100mg	100mg	100mg	100mg	
IAX-700-205-M100 pH-Selector™	0µl	200	160µl	120µl	80µl	
IAX-700-400 DMPC plus API	40mg	40mg	40mg	40mg	40mg	
IAX-900-001/-002/003/-009/-012/-013*	to 4ml final	to 4ml final	to 4ml final	to 4ml final	to 4ml final	

Lipodisq™ SMA Polymer References

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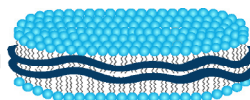
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Related Powered by Lipodisq™ Products for Nano-formulated Drug Delivery

IAX-700-100	Lipodisq™ Control Sterile Solution
IAX-700-101	Curcumin Lipodisq™ Sterile Solution
IAX-700-102	Melatonin Lipodisq™ Sterile Solution
IAX-700-103	Metformin Lipodisq™ Sterile Solution
IAX-700-104	Oxyresveratrol Lipodisq™ Sterile Solution
IAX-700-105	Resveratrol Lipodisq™ Sterile Solution
IAX-700-106	Umifenovir Lipodisq™ Sterile Solution
IAX-700-107	Dexamethasone Lipodisq™ Sterile Solution
IAX-700-108	Ambroxol Lipodisq™ Sterile Solution
IAX-700-109	Retinoic Acid Lipodisq™ Sterile Solution
IAX-700-201	Lipodisq™ Styrene:Maleic Acid Copolymer 1:1 [SMA-100]
IAX-700-202	Lipodisq™ Styrene:Maleic Acid Copolymer 2:1 [SMA-200]
IAX-700-203	Lipodisq™ Styrene:Maleic Acid Copolymer 3:1 [SMA-300]
IAX-700-204	Lipodisq™ Styrene:Maleic Acid Copolymer 4:1 [SMA-400]
IAX-700-205	Lipodisq™ Universal Styrene:Maleic Acid Copolymer with pH-Selector™ [uSMA with pH-Selector™]
IAX-700-400	DMPC (1,2-Dimyristoyl-sn-glycero-3-phosphocholine) (14:0 PC)

Endotoxin-free and Sterile Buffers and Related Products

IAX-900-001	PBS Endotoxin-free (sterile)
IAX-900-001DC	PBS Endotoxin-free (sterile) [For Nano-formulated Drug Analysis]
IAX-900-002	ddWater Endotoxin-free (sterile)
IAX-900-002DC	ddWater Endotoxin-free (sterile) [For Nano-formulated Drug Analysis]
IAX-900-003	Physiological Saline [Sodium Chloride 0.9% Endotoxin-free] (sterile)
IAX-900-003DC	Physiological Saline [Sodium Chloride 0.9% Endotoxin-free] (sterile) [For Nano-formulated Drug Analysis]
IAX-900-004	PBS with EDTA Endotoxin-free (sterile)
IAX-900-005	TRIS with EDTA [TE Buffer] (100x) Endotoxin-free (sterile)
IAX-900-006	EDTA (400mM) Endotoxin-free (sterile)
IAX-900-007	HEPES Buffer (500mM) Endotoxin-free (sterile)
IAX-900-008	DNA Loading Buffer with TRIS and EDTA (6x) (Blue)
IAX-900-009	HEPES Buffer (50mM) with NaCl [Sodium Chloride] (150mM) Endotoxin-free (sterile)
IAX-900-010	NaCl [Sodium Chloride] (1.5M) Endotoxin-free (sterile)
IAX-900-011	TRIS Buffer (1.5M) Endotoxin-free (sterile)
IAX-900-012	TRIS Buffer (30mM) with NaCl [Sodium Chloride] (150mM) Endotoxin-free (sterile)
IAX-900-013	PBS with Magnesium and Calcium Endotoxin-free (sterile)
IAX-900-014	ddWater with 0.9% Benzyl Alcohol [Bacteriostatic Water] Endotoxin-free (sterile)

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