



## ProFoldin

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# INSTRUCTIONS

## ProFoldin

### Styrene - Maleic Acid Copolymer 2:1 for Nanodiscs

Styrene - Maleic Acid Copolymer 2:1 Free Acid- 100 mg

Styrene - Maleic Acid Copolymer 2:1 Free Acid - 500 mg

Styrene - Maleic Acid Copolymer 2:1 Free Acid - 5000 mg

Styrene - Maleic Acid Copolymer 2:1 Free Acid - 25 g

Styrene - Maleic Acid Copolymer 2:1 Sodium Salt- 100 mg

Styrene - Maleic Acid Copolymer 2:1 Sodium Salt - 500 mg

Styrene - Maleic Acid Copolymer 2:1 Sodium Salt - 5000 mg

Styrene - Maleic Acid Copolymer 2:1 Sodium Salt - 25 g

Styrene - Maleic Acid Copolymer 2:1 Solution, pH 7.6 – 10 ml

SMA21-100MG

SMA21-500MG

SMA21-5000MG

SMA21-25G

SMA21S-100MG

SMA21S-500MG

SMA21S-5000MG

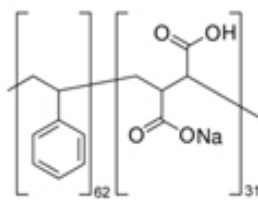
SMA21S-25G

SMA21-10ML

## INTRODUCTION

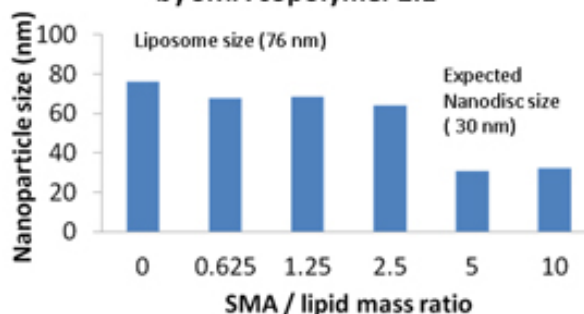
Styrene - maleic acid (SMA) copolymers are broadly used for function and structure studies of membrane proteins. The significant advantages of using SMA copolymers include (1) generating a detergent-free system and (2) forming bilayer nanodiscs with phospholipids. Application of SMA copolymers opens an avenue of membrane protein extraction from cell membranes and proteoliposomes in the absence of detergent. The extracted membrane proteins are stabilized in the nanodiscs that mimic the bilayer structure of lipids in nature. The membrane proteins in nanodiscs can be purified and employed in biochemical, biophysical and biological experiments. For example, the nanodiscs can be used for structure studies of membrane proteins by electronic microscopy (EM). Typically SMA copolymers 2:1 forms nanodiscs in a size about 30 nm while SMA copolymers 3:1 forms nanodiscs in a size about 10 nm. The ideal pH for nanodisc formation is between pH 7.0 – 8.0.

SMA copolymer 2:1  
Structure



MW = 10 kDa

DOPC liposome solubilization  
by SMA copolymer 2:1



**Styrene - Maleic Acid Copolymer 2:1 Free Acid** is the free acid form of SMA Copolymer with a molar ratio of styrene to maleic acid of 2:1. The copolymer molecular weight is 10.1 kDa. The free acid form of SMA copolymer is soluble in a pH 8.5 buffer. The package size is 100 mg, 500 mg, 5000 mg and 25 g.

**Styrene - Maleic Acid Copolymer 2:1 Sodium Salt** is the sodium salt form of SMA copolymer with a molar ratio of styrene to maleic acid of 2:1. The copolymer molecular weight is 10.4 kDa. The salt form of SMA copolymer is soluble in pure water. The package size is 100 mg, 500 mg, 5000 mg and 25 g.



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# INSTRUCTIONS

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**Styrene - Maleic Acid Copolymer 2:1 Solution, pH 7.6 – 10 ml** includes 10 ml of 5% Styrene - Maleic Acid Copolymer 2:1 in 0.1 M Tris-HCl, pH 7.6.

### Preparation of 5% SMA copolymer stock solution from the solid polymer

A convenient way to make nanodiscs is to use a stock solution of 5 % SMA copolymer. The pH is adjusted to 7.6 which is optimal for nanodisc formation. The solution is filtrated through a 0.8 um filter and stored in a 4°C refrigerator or -20 °C freezer. Note: The buffer used for SMA copolymer nanodiscs should be between pH 6 – 9, preferably pH 7 – 8. A lower pH will result in precipitation of the copolymer and a higher pH will destabilize the nanodisc structure.

### Formation of nanodiscs from cell membranes

Incubate 15 mg of cell membrane in 5 ml of 50 mM Tris-HCl, pH 7.6, 0.5 M NaCl, and 10 % glycerol with 5 ml of 5 % SMA copolymer, pH 7.6 by gentle agitation at room temperature overnight.

### Formation of nanodiscs from Proteoliposomes

Incubate proteoliposomes composed of 15 mg of lipids and reconstituted membrane proteins in 5 ml of 50 mM Tris-HCl, pH 7.6, 0.5 M NaCl, and 10 % glycerol with 5 ml of 5 % SMA copolymer, pH 7.6 by gentle agitation at room temperature overnight.

### Purification of nanodiscs

Nanodiscs can be dialyzed using dialysis membranes to remove small molecules and concentrated by ultrafiltration. Size exclusion chromatography (SEC) can be employed for purification of nanodiscs.

### Protein purification

SEC or affinity column chromatography can be employed for membrane protein purification of the discoidal membrane proteins. However, complete solubilization with a proper detergent to the size of molecular level is often required to gain high purity proteins. The chromatographically purified proteins in detergent micelles are reconstituted in liposomes or nanodiscs.

### References

Jonas M. Dörr et al, The styrene–maleic acid copolymer: a versatile tool in membrane research. *Eur. Biophys. J.* (2016) 45:3 - 21.

### RELATED PRODUCTS

Styrene - Maleic Acid Copolymer 3:1 Free Acid- 100 mg	SMA31-100MG
Styrene - Maleic Acid Copolymer 3:1 Free Acid- 500 mg	SMA31-500MG
Styrene - Maleic Acid Copolymer 3:1 Free Acid- 5000 mg	SMA31-5000MG
Styrene - Maleic Acid Copolymer 3:1 Free Acid- 25g	SMA31-25G
Styrene - Maleic Acid Copolymer 3:1 Sodium Salt- 100 mg	SMA31S-100MG
Styrene - Maleic Acid Copolymer 3:1 Sodium Salt- 500 mg	SMA31S-500MG
Styrene - Maleic Acid Copolymer 3:1 Sodium Salt- 5000 mg	SMA31S-5000MG
Styrene - Maleic Acid Copolymer 3:1 Sodium Salt- 25g	SMA31S-25G
Styrene - Maleic Acid Copolymer 3:1 Solution, pH 7.6 – 10 ml	SMA31-10ML

For more information of protein science products, please visit our website at [www.profoldin.com](http://www.profoldin.com).