



## ProFoldin

10 Technology Drive, Suite 40, Number 188

Hudson, MA 01749-2791 USA

Phone: (508) 735-2539

FAX: (508) 845-9258

[www.profoldin.com](http://www.profoldin.com)

[info@profoldin.com](mailto:info@profoldin.com)

# INSTRUCTIONS

## ProFoldin

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

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

SMA21-100MG

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

SMA21-500MG

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

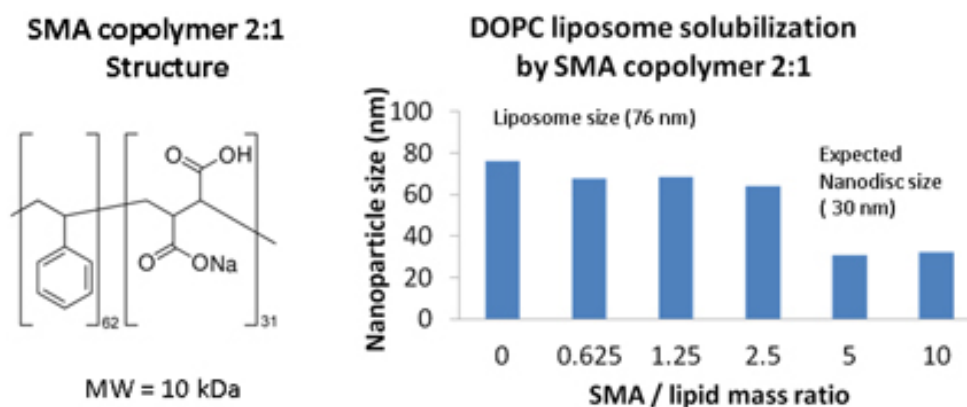
SMA21S-100MG

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

SMA21S-500MG

## 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.



**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 package size is 100 mg (catalog No. SMA21-100MG) or 500 mg (catalog No. SMA21-500MG)

**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 package size is 100 mg (catalog No. SMA21S-100MG) or 500 mg (catalog No. SMA21S-500MG)



## ProFoldin

10 Technology Drive, Suite 40, Number 188

Hudson, MA 01749-2791 USA

Phone: (508) 735-2539

FAX: (508) 845-9258

[www.profoldin.com](http://www.profoldin.com)

[info@profoldin.com](mailto:info@profoldin.com)

# INSTRUCTIONS

---

## Preparation of 5% SMA copolymer stock solution

A convenient way to make nanodiscs is to use a stock solution of 5 % SMA copolymer, pH 7.6. There are two methods to make the stock solution. One is to dissolve 150 mg of the salt or acid form of SMA copolymer in 2.7 ml of 0.1 M Tris-HCl, pH 8.0 buffer and adjust the pH to 7.6 and the total volume to 3.0 ml. The other method is to dissolve 100 mg of the salt form and 50 mg of the acid form of SMA copolymer in 2.9 ml of 0.1 M Tris-HCl, pH 8.0 buffer that gives 5 % SMA copolymer solution, pH 7.6. The solution is filtrated through a 0.8 um filter and stored in a 4C refrigerator or -20 C freezer.

## Buffer pH requirement for stabilization of SMA copolymer nanodiscs

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 Sodium Salt- 100 mg	SMA31S-100MG
Styrene - Maleic Acid Copolymer 3:1 Sodium Salt- 500 mg	SMA31S-500MG
Membrane Protein Extraction Kit	MPE01-12S
Spin-column Membrane Protein Folding Screen Kit	MFC01-20
Detergent assay kit	DAK1000
MicroGram Lipid Assay Kit	LIP1000

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

---