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Lab & Production Materials

Protocol

NanoFabTx™ Polymers for microneedles

Polyvinyl alcohol

Protocol for Catalog No # 938858

Introduction

NanoFabTx™ Polymers for Microneedles are carefully selected polymers that can be used to formulate microneedle patches. Microneedles are tiny projections of needles approximately 400-800um in length arranged in a small 1cm x 1cm patch. Microneedles are composed of blends of synthetic or natural polymers at suitable concentrations. Polyvinyl alcohol (PVA) is a synthetic water-soluble polymer and it widely used in many drug delivery applications. It is a biocompatible polymer which is available in different molecular weights. The formation of the microneedles depends on the molecular weight and concentration of PVA.

The NanoFabTx™ Polymers for Microneedles can be used with the microneedle templates to formulate microneedle that can be used for several applications, such as delivering various therapeutic molecules and vaccine antigens via the skin.

The selected polymer will enable users to:

1) save time in selecting the polymer and provide a starting point to formulate microneedles by avoiding lengthy trial-and-error optimization.
2) formulate microneedles for various drug delivery applications.

Disclaimer

NanoFabTx™ Polymers for Microneedles is for research use only; not suitable for human use. Please consult the Safety Data Sheet for information regarding hazards and safe handling particles.

Storage and stability: Protect from light. Refer to the expiration date on the batch-specific Certificate of Analysis.

Materials needed

Catalog Number	Product description
934585	Microneedle template
HS4323	Centrifugation tubes 2 mL
HS4426R	Centrifugation tubes 50 mL
1.07735	Silica gel (Desiccant)
D2672	Desiccator
	Deionized water

Procedure

Preparation of polymer solution:

- Prepare the polymer solution using the suggested formulations provided in Table 1.

Table 1. List of formulation suggested to be prepared

Formulation	PVA (mg)	Volume of water (mL)
7.5 % w/v	75	1
10 % w/v	100	1

Table 1. List of formulation suggested to be prepared

- Dissolve NaCMC, average Mw ~250,000, degree of substitution 1.2, (Cat No. 938866) in deionized water.
- Remove air bubbles from the solution by centrifuging the solution for 2-3 minutes using a benchtop minicentrifuge.

Procedure to prepare the microneedle patch:

- Cast the polymer solution on to the microneedle template.
- Centrifuge the filled microneedle template at 4000-5000 rpm for 15-20 minutes at 37-40°C.
  Note: *Centrifugation needs to be done using a swinging bucket rotor to prepare microneedles. Alternatively, the filled microneedles can be subjected to vacuum (vacuum pressure needs to be optimized). Drug/therapeutic may be mixed with the polymer and applied to the microneedle template to fill the microneedle cavities.*

- Another layer of NaCMC solution may be added and centrifuged at 4000-5000 rpm for 15-20 minutes at 37-40°C. This additional layer will serve as a backing layer.
- Dry the microneedles in a desiccator overnight at room temperature.
  Note: *The drying time may vary depending on the concentration of the polymer solution.*
- Carefully demold using double-sided tape, forceps, the microneedle loader set (Cat #934631), or microneedle spring applicator set (Cat #934623).
- Store the microneedles in a desiccator.

Clean the microneedle templates:

- The microneedles templates should be cleaned using DI water. A gentle lab detergent may also be used.
- Bath sonication can be used to remove any residual polymer.
- Dry the microneedle templates using hot air oven set to 50-60°C.
- Store the dried microneedle templates in polybags to protect from dust.