

## Protocol

### NanoFabTx™ Polymers for microneedles

GelMA hydrogel kit

Protocol for Catalog No # [938831](#)

## 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. Gelatin methacrylate (GelMa) is a hydrogel-forming polymer that can photo-crosslink using polymerization initiators like lithium phenyl-2,4,6-trimethylbenzoylphosphinate (LAP) and can be used in many drug delivery applications.

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
<a href="#">934585</a>	Microneedle template
<a href="#">HS4323</a>	Centrifugation tubes 2 mL
<a href="#">HS4426R</a>	Centrifugation tubes 50 mL
<a href="#">1.07735</a>	Silica gel (Desiccant)
<a href="#">D2672</a>	Desiccator
	UV LED Light (365-400nm)
	Deionized water

## Procedure

### Preparation of polymer solution:

- Prepare the polymer solution using the suggested formulations provided in Table 1.
- Dissolve gelatin methacrylate, gel strength 300 g Bloom, 80% degree of substitution, Cat # [900496](#) (Sigma-Aldrich) (10-15% w/v), LAP cat# [900889](#) (Sigma-Aldrich) (0.05%w/v) in deionized water. Protect the hydrogel from light.

Note: The suggested formulation is using gelatin methacrylate, gel strength 300 g Bloom, 80% degree of substitution, Cat # [900496](#) (Sigma-Aldrich), and LAP cat# [900889](#). Using of different grade of GelMa will result in different results.

### 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 10 minutes at room temperature, protected from light.
- Crosslink the GelMa by exposing the filled microneedle template to UV LED Light (365-400nm) for 2-3 minutes.

**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 GelMa without the crosslinking agent LAP may be added and centrifuged at 4000-5000 rpm for 10 minutes at room temperature. This additional layer will serve as a backing layer.
- Dry the microneedle at room temperature overnight.  
**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).
- To store, store the microneedles in a desiccator.

Table 1. List of formulation suggested to be prepared

Formulation	Weight of GelMa (mg)	Wight of LAP (mg)	Volume of water (mL)
10 % w/v	100	0.5	1
10 % w/v	500	2.5	5

**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.

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