

Fabrication of a bilayer with poly(*N*-isopropylacrylamide-*co*-acrylic acid) (pNIPAm-AAc) hydrogel and SU-8 photoresists

Paul Chong
Grace Woods

Purpose

Here, we report a procedure for the surface treatment of SU-8 and fabrication of a functional bilayer of SU-8 and photodefineable pNIPAm-AAc thermally responsive hydrogel.

Materials

- SU-8 photoresist
- Jeffamine D230
- poly(*N*-isopropylacrylamide) (pNIPAm)
- *N*-isopropylacrylamide (NIPAm)
- acrylic acid
- *N,N'*-methylenebis(acrylamide)
- lithium phenyl(2,4,6-trimethylbenzoyl)phosphinate
- 1-butanol
- isopropanol

Procedure

A. Surface treatment of SU-8 for adhesion to pNIPAm-AAc hydrogel

1. Following patterning and development of SU-8 structures, submerge structures in pure Jeffamine D230 or a solution of Jeffamine in solvent.
2. Leave SU-8 soaking overnight at room temperature or, alternatively, heat the Jeffamine with SU-8 at 50 °C for 2-4 hours.
3. Rinse SU-8 thoroughly with isopropanol 3-5 times.
4. To confirm the presence of Jeffamine on SU-8, you may spot test a portion of SU-8 with a ninhydrin stain and heat gently. If Jeffamine is present, the stain should develop from colorless to purple or pink in color.

B. Formulation and patterning of pNIPAm-AAc photoresist

1. Into a vial, add 1-butanol (7.5 mL), pNIPAm (0.4 g), NIPAm (3 g), *N,N'*-methylenebis(acrylamide) (180 mg), and acrylic acid (0.3 mL).
2. Stir at room temperature with stir bar overnight or until fully dissolved.
3. Cover vial with foil if not working in yellow light conditions, add lithium phenyl(2,4,6-trimethylbenzoyl)phosphinate (30 mg), and stir until dissolved.
4. Dropcast or spin coat resist onto Jeffamine-treated SU-8 and expose with 365 or 405 nm light at 15 mW/cm² for 60 s.
5. Develop and rinse with water or alcohols such as ethanol or isopropanol.