



# SeRM Super Polymer

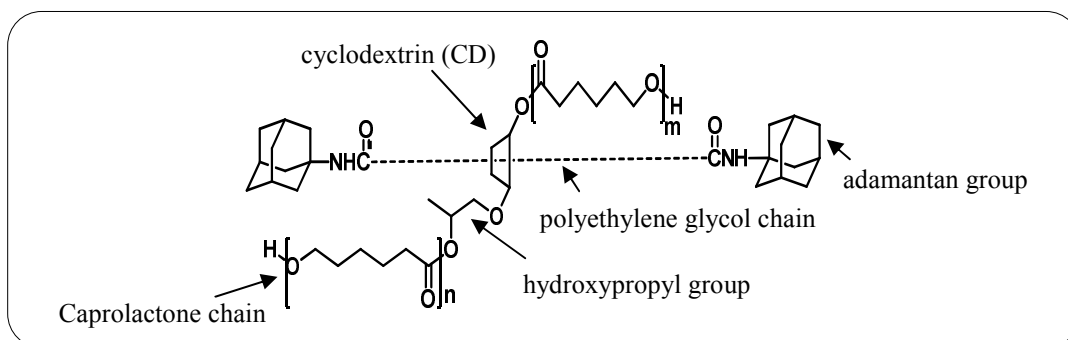
## User's Guide

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- Cover Page .....1P
- Chemical Structural Formula .....2P
- Basic Data .....2P
- Fabrication of Elastomer .....3P
- Fabrication of Coating and Films .....4P

## ■ Chemical Structural Formula

SeRM Super Polymer is a polyrotaxane containing hydroxyl groups. Similar to polyols, it can be used to produce polyester, polyurethane, and epoxy for use as paint, adhesives, glue, sealant, and elastomer.

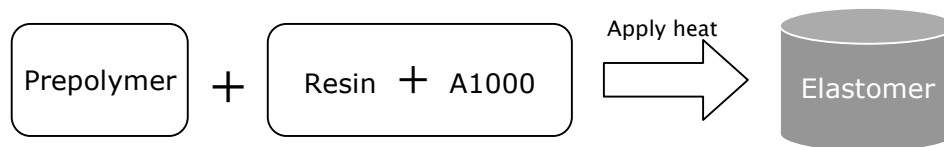


## ■ Basic Data

Product name	SeRM Super Polymer A1000
Chemical name	Modified polyrotaxane-graft-polycaprolactone
CAS No.	928045-45-8
Chemical Substance Control Law	Clearance received (Article 4, Section 1, Substance 5)
Appearance	Solid with white to opal color
Solubility	Soluble in toluene, xylene, acetone, MEK, THF, acetic ester. Insoluble in methanol and ethanol.
Average Molecular Weight	600,000(Mw)
Melting Point	Approximately 50° C
Decomposition Temperature	280° C (in air)
Hydroxyl value	72 mgKOH/g (average value)

## ■ Fabrication of Elastomer

- Standard method for fabricating elastomer



### <Step 1> Fabrication of prepolymer (example)

1. To a reaction vessel purged with nitrogen gas, add 1,3- bis(isocyanatomethyl)-cyclohexane (56g) and stir at 80° C under oil bath. ... (A)
2. Dissolve polyol\*1 (100g, hydroxyl value: 140 mgKOH/g) in toluene \*2 (100g). ... (B)
3. Add dropwise solution (B) into (A). (\* Maintain the temperature at 80° C.) ... (C)
4. Stir (C) at 80° C for 2 hours. ⇒ Prepolymer solution with isocyanate concentration of 5.6 wt% is obtained\*3.

\*1. Polyether polyol, polyester polyol, or polycarbonate diol can be used as a polyol.

\*2. It is possible to use different amounts and types of solvent.

\*3. It is recommended that the prepolymer solution is used immediately.

### <Step 2> Fabrication of elastomer

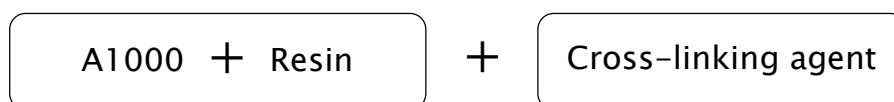
1. Prepare a uniform mixture of A1000, resin, and solvent.
2. Add an appropriate catalyst. (Example: 0.01wt% of tin catalyst for a mixture of A1000 and resin.)
3. Add an amount of the prepolymer solution based on the total hydroxyl groups of the above A1000/resin solution. Stir to make a uniform mixture.
4. After removing foam from the mixture, apply the mixture to form films using a well-known method, or pour the mixture into a desired mold. Heat the mixture to cure. The curing temperature and time differ depending on the crosslinking agent or solvent used. It is typically cured in approximately 30 minutes or more at 50° C ~ 150° C. → Elastomer is obtained.

#### Note:

1. Use resin that is compatible with A1000.
2. The resin must contain functional groups that can react with isocyanate. (Example: hydroxyl group or amino group.)

## ■ Fabrication of Coating and Films

- Standard formulation with resin and the curing



1. Dissolve A1000 in a solvent at an appropriate concentration and add to resin. Make a uniform mixture.
2. Next, add an appropriate amount of cross-linking agent (multi-functional isocyanate such as hexamethylene diisocyanate and polyisocyanate) based on the total hydroxyl groups of the A1000/resin solution. Make a uniform mixture.
3. After removing foam from the mixture, apply the mixture to form coatings/films using a well-known method and then heat to cure. It can also be poured into a desired mold and cured. The curing temperature and time differ depending on the cross-linking agent or solvent used. It is typically possible to cure it in approximately 15 minutes or more at a room temperature or up to 150° C. The solvent is removed during curing.

### Note:

1. Use resin that is compatible with A1000.
2. Functional groups of A1000 are hydroxyl groups. The resin must contain functional groups that can react with the hydroxyl groups in A1000, or it must contain functional groups (such as hydroxyl group or amino group) that can react with the hydroxyl groups in A1000 through a cross-linking agent.
3. To accelerate curing, add a small amount of tin catalyst as needed.

- Application as paint.

Applications as a “solvent-based curing clear paint” as described in patent no. 4376848 may require a licensing from Advanced Softmaterials Inc. Prior consultation is necessary. Licensing may not be provided for all applications.

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