

# Ionic Polymer Gelling Agent



*Polymer &  
Cross linker*



*Organic Solvents*

*Ionic Liquids*



## Features

- ★ Capable of gelling Organic Solvent & Ionic liquid.  
**Capable of gelling Electrolyte solution.**
- ★ Forming Ionic gel  
**Maintain Conductivity**
- ★ Irreversible reaction type of chemical gel  
**Maintain gel state under high temperature**

## Product Information

Gel is one of the soft matters and it has the middle of unique characteristic between a liquid and a solid, it's widely used as it has the flexible material. On the other hand, since the most of gels are hydrogel, it is said that it's unsuitable for adopting with organic solvents.

In these years, its expected to use with the functional solvents for example Ionic liquid as expectation are glowing for using as hybrid-gel which added many functions as the next generation softer.

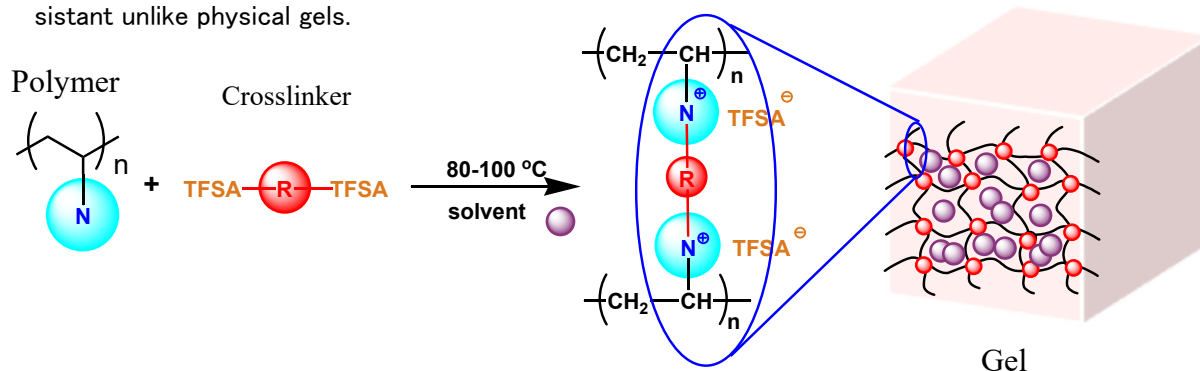
We have developed Gelling agent which has the following unique characteristics by combining polymers and cross linkers.

- Applicable to a lot of type of organic solvents and ionic liquids.
- Maintain Conductivity after gelling of conductive material since Gelling agent itself has conductivity.
- Maintain gel characteristic even under high temperature since its chemical gel.

The trial kit is prepared. We would like for you to feel free to try it.

## Structure of Gel

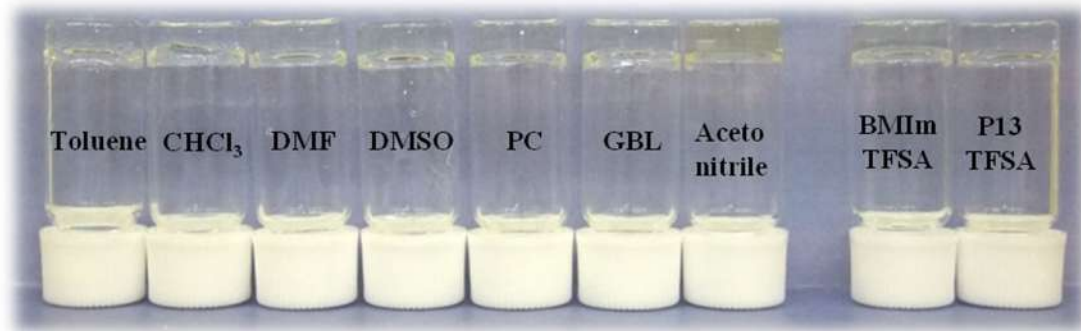
Chemical gel by using crosslinkers. Its capable of maintaining gel state because of high temperature resistant unlike physical gels.



## Capability

### Example of gelling organic solvents

Our gelater is capable of gelling Ionic liquids and organic solvents which have wide range of polarities such as Toluene and Acetonitrile.








Solvents that can be gelled or Gelable solvents

Organic solvents : Toluene, Chloroform, Dichloromethane, Acetone, DMF, DMA, NMP, EC, PC, GBL, Acetonitrile, Methoxyacetonitrile, Methoxypropionitrile(MPN) etc.

Ionic liquids: BMIImTFSA, EMIImTFSA, P13TFSA, PP13TFSA, BMIImOTf etc.

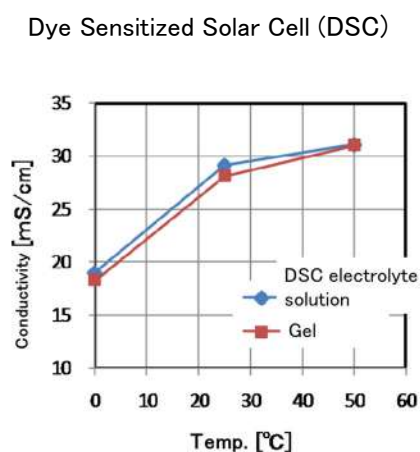
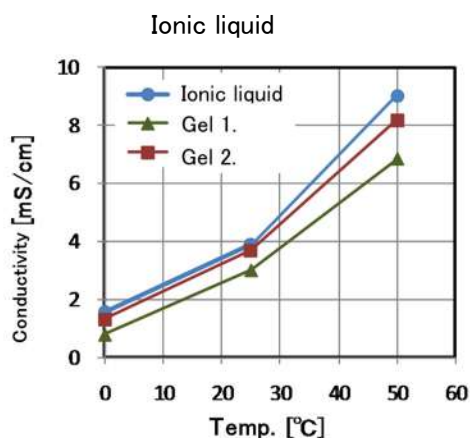
## Example of gelling electrolyte solution

It's capable of gelling electrolyte solution even together with electrolytes such as Lithium salts and Ammonium salts.

Application	Dye Sensitized Solar Cell (DSC)	Lithium ion Battery (LIB)	Electric double-layer capacitor (EDLC)	Electrolytic capacitor (EC)	Electrochemiluminescent Device (ECL)
Electrolyte	I <sub>2</sub> (0.01M) LiI (0.1M)	LiTFSA (1.0M)	NEt <sub>4</sub> BF <sub>4</sub> (1.0M)	Phthalic acid (0.6M) TEA (1.2M)	Ru(bipy) <sub>3</sub> Cl <sub>2</sub> (2.5wt%) NaClO <sub>4</sub> (0.01M)
Solvent	Acetonitrile	PC	PC	GBL : Sulfolane (=3:2)	GBL
Sample					

## Conductivity changes

Few conductivity changes by gelling electrolyte solution.



Ionic Liquid : BMImTfSA

Gel 1. : P4VP-C12TfSA(40g/L:50g/L)

Gel 2. : PDMEMA-C12TfSA(40g/L:50g/L)

Formula of : PMImI(0.6M)

Electrolyte solution TBP (0.5M)

LiI (0.1M)

I<sub>2</sub> (0.05M)

Acetonitrile

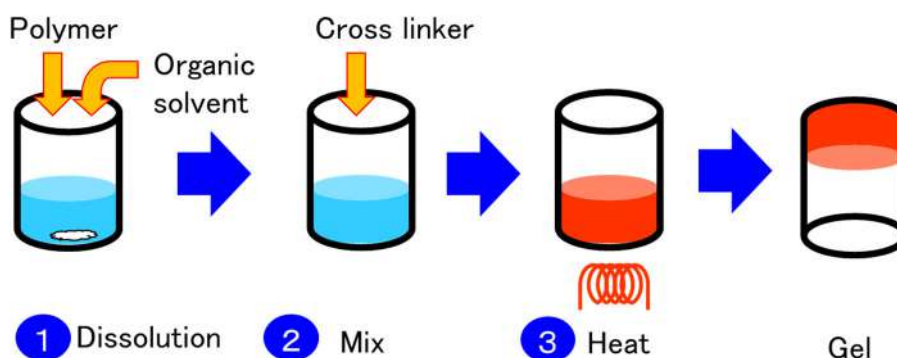
Gel : PDMEMA-C12TfSA(50g/L:50g/L)



## Preparation method

Just putting a polymer and cross linker, and heat it. And it turn into a gel.

No need any cooling operations which are used for a preparation method of physical gels.



## Example of Gelation

	Organic solvent	Gelling agent				
		Polymer	Conc. (g/L)	Cross linker	Conc. (g/L)	
Organic solvent	GBL	P4VP	50	C12TFSA	50	
			70	C6TFSA	50	
	PC	P4VP	50	C12TFSA	50	
			50		50	
		Acetonitrile	PDMEMA		50	50
					100	50
Toluene	PDMEMA	40	C12TFSA	50		
		40		50		

## Product List

### ◆ Trial kit

Cat. No.	Name	Kit contents	Abbr.	Size
17472-96	Gelatinizer trial kit GK-1	Poly(4-vinylpyridine)	P4VP	5g
		Poly(dimethylaminoethyl Methacrylate), Solution in Toluene	PDMEMA	15ml
		<i>N,N,N',N'</i> -Tetra(trifluoromethanesulfonyl)-hexane-1,6-diamine	C6TFSA	3g
		<i>N,N,N',N'</i> -Tetra(trifluoromethanesulfonyl)-dodecane-1,12-diamine	C12TFSA	3ml

### ◆ Single article

Name	Abbr.	Size	Cat. No.
Poly(4-vinylpyridine)	P4VP	10g	32294-45
Poly(dimethylaminoethyl Methacrylate), Solution in Toluene	PDMEMA	20ml	32295-35
<i>N,N,N',N'</i> -Tetra(trifluoromethanesulfonyl)-hexane-1,6-diamine	C6TFSA	5g	40797-55
<i>N,N,N',N'</i> -Tetra(trifluoromethanesulfonyl)-dodecane-1,12-diamine	C12TFSA	5ml	40798-55

※Poly(dimethylaminoethyl Methacrylate) contains Toluene. Please weigh after removing Toluene if it's inconvenient for your process.

※JP5766942

- Please use the products listed in the catalog as reagents (chemicals used for testing or research purpose).
- Product information is subject to change without notice. For the latest information, please have a look at our website "Cica-Web".

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