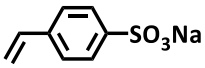
TOSOH

SPINOMAR®NaSS

Sodium p-styrenesulfonate

1.Introduction

Sodium p-styrenesulfonate (NaSS) is a unique sulfonated monomer having the highest reactivity among the sulfonated vinyl monomers. TOSOH produces the hemihydrate form of NaSS which provides more storage stability and better handling. Key properties include low toxicity, high reactivity, sulfonate functionality and good surface activity which lead to its use in varied and unique applications.

GENERAL		REGISTRATIONS		
Product name :	SPINOMAR®NaSS	REACH	Registered	
Generic name :	Sodium p-styrenesulfonate	TSCA	Listed	
CAS No.	2695-37-6	METI	3-1903	
Chemical formula :		ECL	KE-13273	
		SPECIFICATION		
		Purity	%	84-92
Appearance :	White solid	NaBr	%	≦4
Molecular Weight :	206.2	NaOH	%	≦1
Bulk density :	ca.0.5g/cm^3	Na_2SO_4	%	≦1
Melting Point :	>330℃	**PATENTS**		
Flammability :	Non-combustible	US9,505,713		
Toxicity :	Non-toxic	JP5946094,JP5930307		

2.Chemical Properties

(1) Surface Activity

The most important feature of SPINOMAR®NaSS is surface activity. It's more active than other aliphatic sulfonate monomers due to its benzene unit, and therefore, it is well suited to applications such as an emulsion polymerization, dispersant etc.

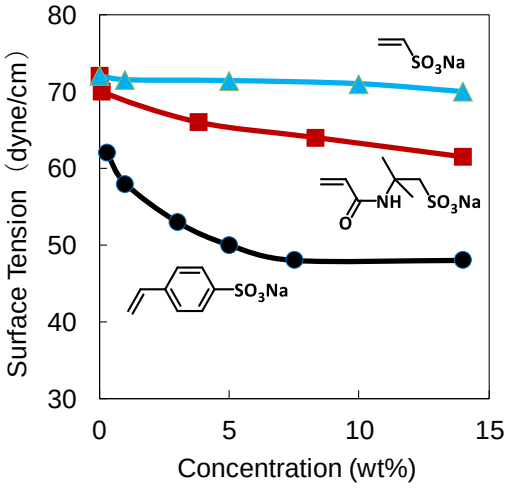


Fig.1 Surface tension of NaSS aq.
(Wilhelmy method, Pt-plate,25℃)

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(2) Thermal Stability

The excellent thermal stability of SPINOMAR®NaSS is shown by TG-DTA. It is well suited to applications that involve high temperatures reaction, due to its benzene sulfonate unit.

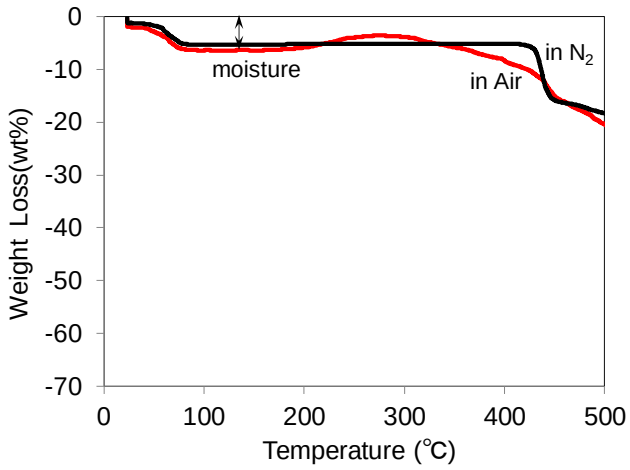

Fig.2 TG-TDA of NaSS
(Temp.: RT→500℃, 10℃/min)

(3) Storage Stability

SPINOMAR®NaSS powder is very stable below 40℃.
Aqueous NaSS solution is also stable below 40℃ and in the range of pH 7 to 10.
On the other hand, spontaneous polymerization proceeds under acidic condition.

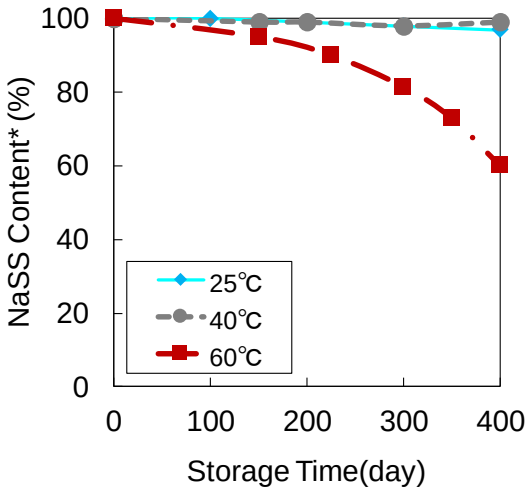

Fig.3 Stability of NaSS powder
(*measured by vinyl activity)

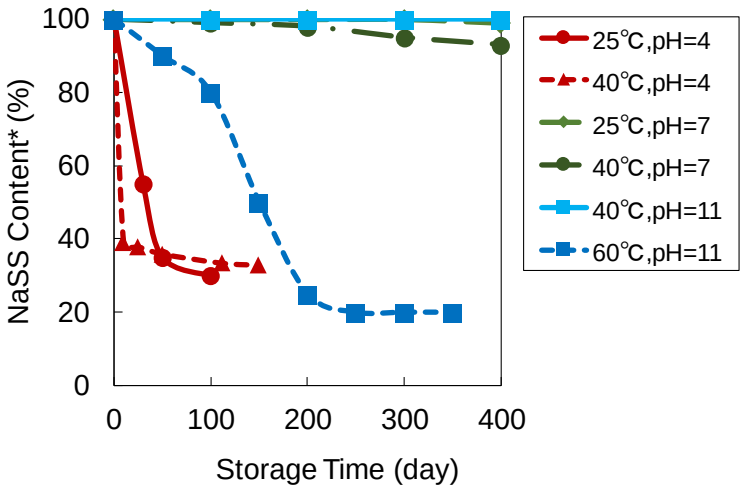

Fig.4 Stability of 15% NaSS aq.
(*measured by HPLC)

(4) Solubility

SPINOMAR®NaSS is soluble in aqueous solvent and easy to (co)polymerize.

Table1 Solubility at 25℃

Solvent	Solubility(wt%)
H_2O	19.6
H_2O	24.0（40℃）
H_2O	28.7（50℃）
DMF	8.7
DMSO	19.2
NMP	6.5
Ethanol	0.3
2-Propanol	0.03
Toluene	insoluble

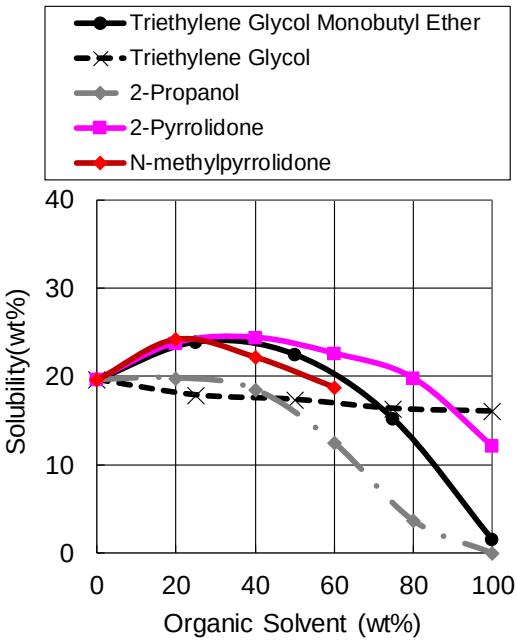

Fig.5 Solubility in mixed solvent at 25℃

(5) Reactivity

SPINOMAR®NaSS is highly reactive monomer activated by benzene sulfonate unit, and therefore it well copolymerizes with conjugated monomers such as methacrylate, styrene etc. On the other hand, special monomer dosing condition is required when copolymerizing with lower conjugated monomers such as N-Vinylpyrrolidone, maleic acid etc.

Table2 Q-e value of NaSS and various monomers

Monomer	Q	e
SPINOMAR®NaSS	2.49	-0.59
2-Acrylamid-2-methylpropane sulfonic acid	0.39	0.22
Sodium vinyl sulfonate	0.06	0.41
Styrene	1.00	-0.80
Methyl methacrylate	0.74	0.40
Methacrylic acid	2.34	0.65
Sodium methacrylate	1.36	-1.18
Acrylonitrile	0.60	1.20
Acrylamide	1.15	1.30
Methacrylamide	1.46	1.24
N-Vinylpyrrolidone	0.14	-1.14
Maleic acid	0.75	1.50

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(6) Examples of copolymerization

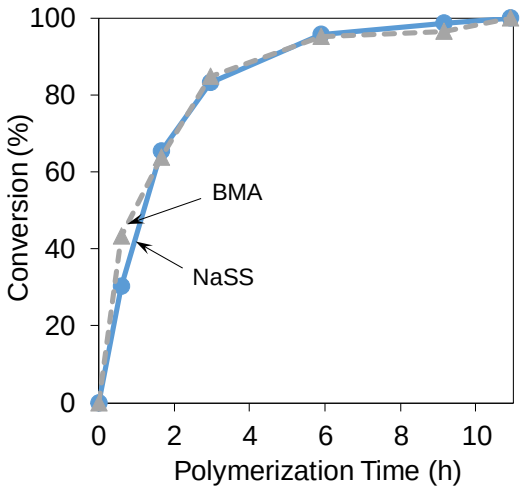

Fig.6 Copolymerization of NaSS with n-Butylmethacrylate
NaSS/BMA/V-50=100/100/3.5mol.r, at 60℃
dosed all at once into water/EtOH mixed solvent

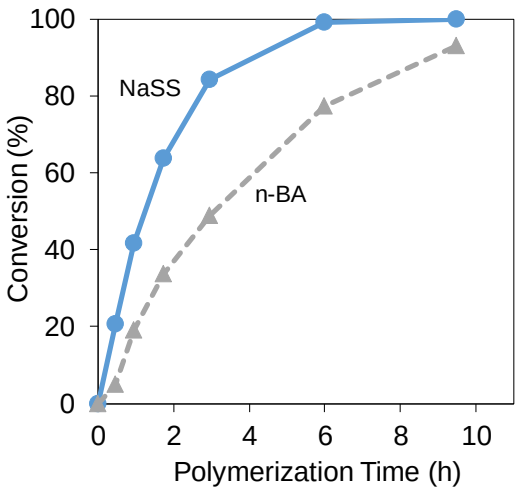

Fig.7 Copolymerization of NaSS with n-Butylacrylate
NaSS/n-BA/V-50=100/100/3.5mol.r, at 60℃
dosed all at once into water/EtOH mixed solvent

Monomer dosing condition is critical when the difference of monomer reactivity is large.

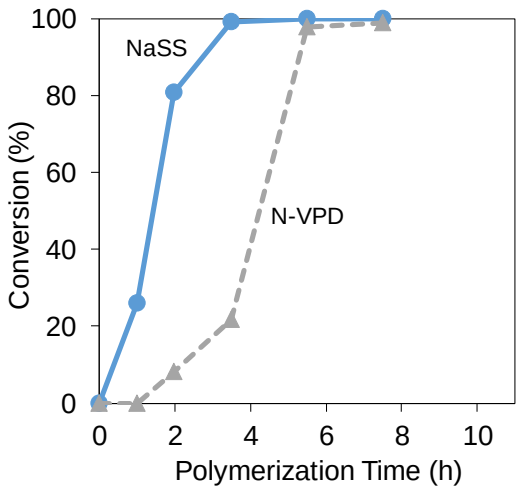

Fig.8 Copolymerization of NaSS with N-Vinylpyrrolidone
NaSS/N-VPD/V-50=100/100/3mol.r, at 80℃
dosed all at once into water

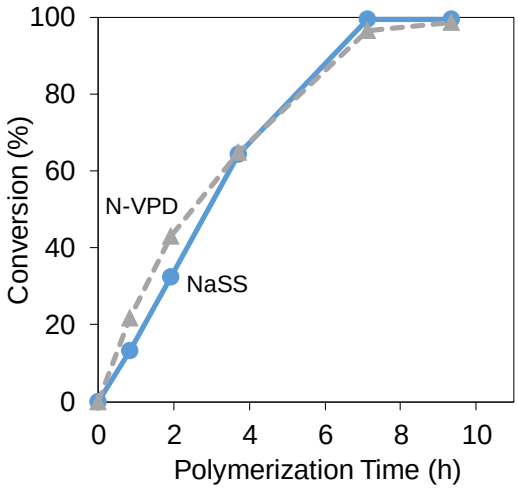

Fig.9 Copolymerization of NaSS with N-Vinylpyrrolidone
NaSS/N-VPD/V-50=100/100/3mol.r, at 80℃
NaSS aq. was dosed into N-VPD aq. in 260min

(7) Biodegradability

SPINOMAR®NaSS is inherently biodegradable according to the OECD 302B method.

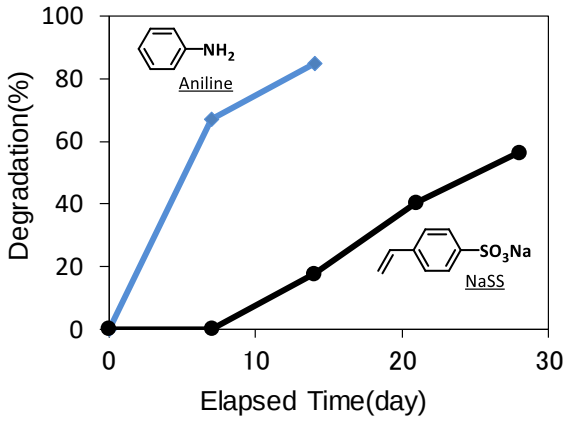

Fig.10 Biodegradability of NaSS (Aniline : reference)

(8) Use of SPINOMAR®NaSS

SPINOMAR®NaSS has been used in various fields as below.

- By emulsion polymerization -
Acrylic Paint
Adhesive (Tire cord,Food package)
Acrylic fiber
Sizing Agent

- By solution polymerization -
Anti-scalant,Anti-allergen fiber
Cation exchange membrane
Photographic paper,Ironing aid
Mold lubricant,Washing agent
Chlorinated-PVC,Nano-filtration
Adjuvant for agrochemical
Prosthetic materials
Thermo-responsible polymer

(9) Shipping and Storage

SPINOMAR®NaSS is supplied in:

- 25KG net polyethylene-lined paper bag
- 500KG net PVC big bag

SPINOMAR®NaSS must be stored at airtight in a dark place like other industrial monomers.

For more information, please contact us

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