

Functional Monomers

Karenz™
AOI-VM™



Molecular Structure Design

Surface Treatment



HPLC Columns

Shodex™
CIM™
Autoprep™

Functional Cosmetic Raw Materials

Apprecier™



Purification

Polymerization Control

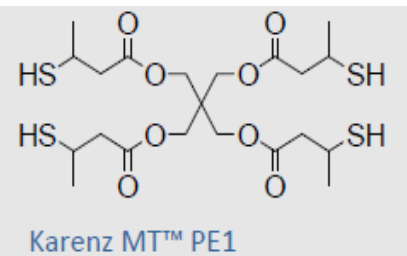


Water-soluble Polymers

VISCOMATE™
PNVA™

Product examples

Multifunctional secondary thiol compound



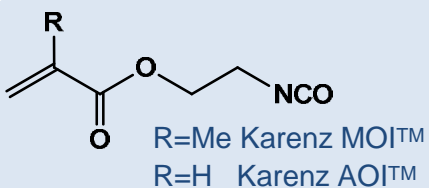
Improves coating performance



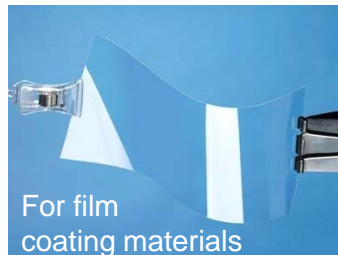
Applications:

- **Epoxy curing agent** (cold & rapid curing, low yellowing, hydrolytic stability)
- **UV curing additive** (higher sensitivity, less oxygen inhibited polymerization, deep curing, adhesion)
- **Ene-thiol reaction** (high transparency, deeper curing)

Monomer containing isocyanate groups

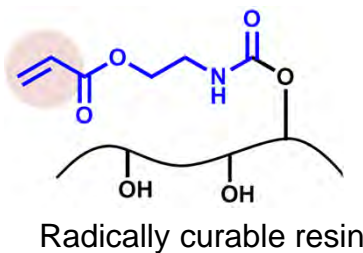
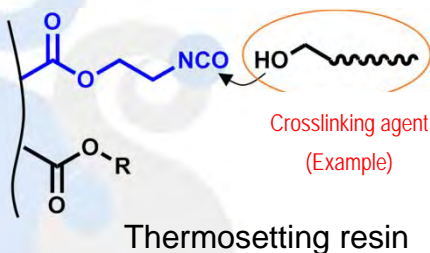


Useful for synthesizing high performance resin



Applications:

- (1) **Synthesizing polymers with NCO pendant** after reacting unsaturated groups (2) **Introducing unsaturated groups** after reacting NCO



Our technologies

■ Molecular structure design technology

To meet the demand for higher performance, we design and provide various functional monomers.

- ◆ Improving adhesion
- ◆ Improving curing reaction performance
- ◆ Providing polymerization ability
- ◆ Providing water solubility
- ◆ Reducing odor, etc.

Molecular design of organic compounds

- Introducing highly reactive functional groups
- Providing multifunctionality

Development of optimal synthesis process

- Minimal step synthesis
- Knowhow to select a reaction catalyst

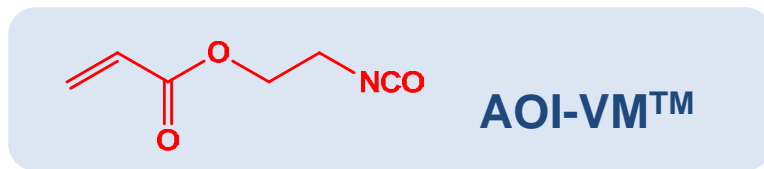
Establishment of industrial process

- Protecting reactive functional groups
- High purification
- Control of water amount

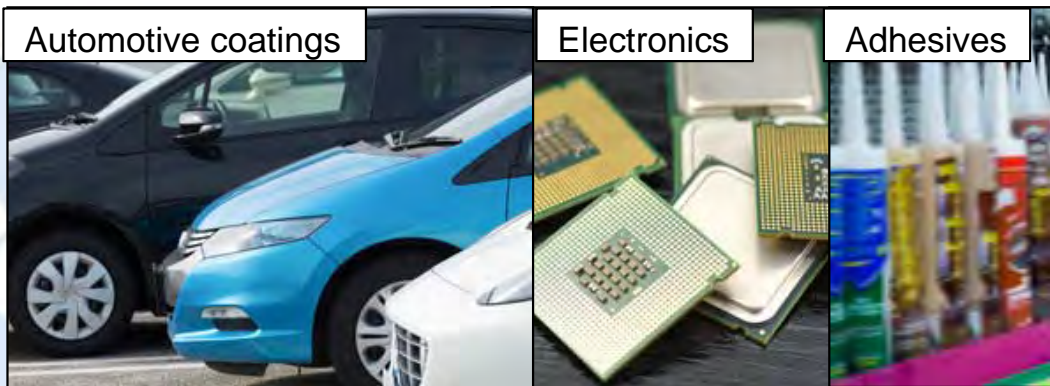
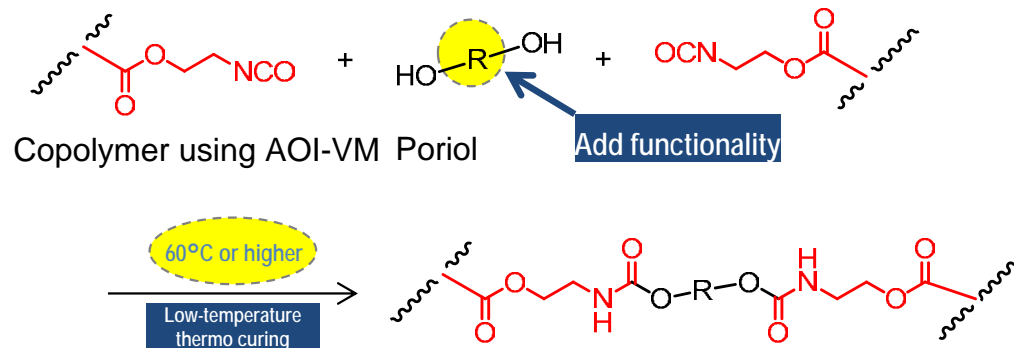
Versatile isocyanate monomer ~AOI-VM™~

Product example

Automotive coating (OEM coatings, refinishing, interiors), construction, painting/coating for electronics, adhesive, etc.



Application: thermosetting resin composites



Our technologies

Production technology

Based on the production technology for Karenz, mass production technology for AOI-VM™ using a continuous plant reduces the price.



Broader customer applications

- ◆ Applicable to versatile paints and coatings, which require low cost

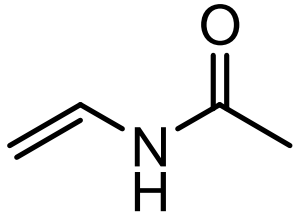


Providing value

- ◆ The only compound (group) that can synthesize polymers with aliphatic NCO pendant
- ◆ Adding functionalities such as low-temperature rapid curing
- ◆ Providing a new development approach

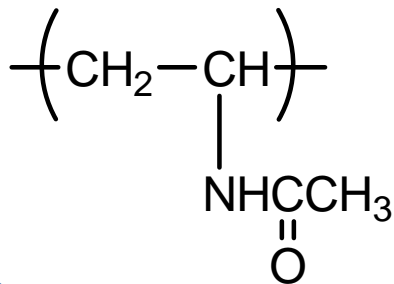
Product examples

NVA (N-Vinyl acetamide)



- Raw material of water-soluble polymers
- Hydrophilization of hydrophobic polymers
- Material of UV curing composites

PNVA™ (Poly-N-Vinyl acetamide)



- Thickening agent
 - Dispersant
 - Gelatinizer
 - Binder
 - Coating agent
 - Adhesive, pressure-sensitive adhesive
- Conductive paste
 - Emulsion thickening
 - Binder for sintering ceramics
 - Inkjet ink absorbing layer
 - Coating agent for heat exchangers

Applications:

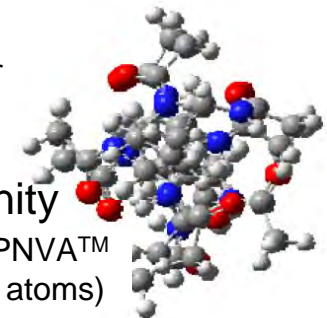
- CMP
- Water-based ink, paint
- Capacitor, secondary battery
- Dispersant for CF, resin kneading
- Thickening agent for acid/alkaline detergent

Our technologies

■ NVA

NVA is an amphiphilic, nonionic, water-soluble monomer produced commercially by our unique technology.

- ◆ Characteristics as a solubilizer
- ◆ Nonionic
- ◆ Water-soluble, solvent affinity

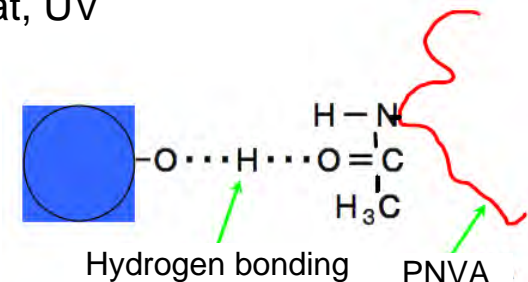


3D structure of PNVA™
(red spheres: O atoms)

■ PNVA™

PNVA™ is a water-soluble polymer produced commercially from NVA by our unique technology.

- ◆ Stable thickening over a wide range of pH
- ◆ Thickening of polar organic solvents
- ◆ Thickening of high salt concentration solutions
- ◆ Resistant to acids and alkalis
- ◆ Viscous and adhesive
- ◆ Resistant to heat, UV
- ◆ Nonionic



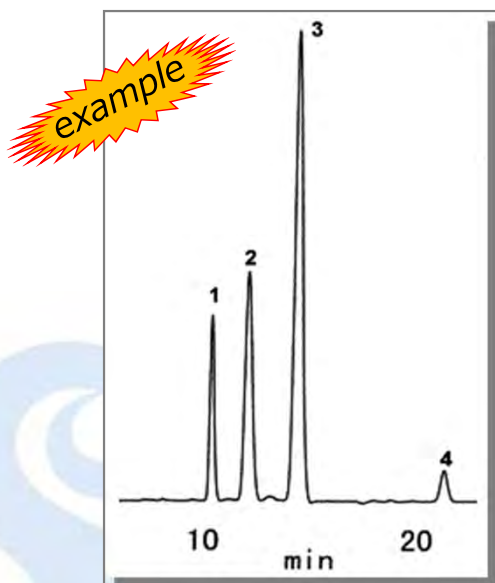
Product Example

High-performance liquid chromatography (HPLC) plays an active role in various fields, including

- Product quality inspection
- Factory process inspection, and
- Environmental analysis.



Analysis of sugar content in apple juice



Sample: Apple juice 5uL
 1. Sucrose
 2. Glucose
 3. Fructose
 4. Sorbitol

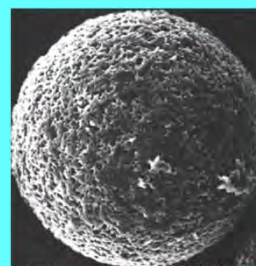
Column: Shodex SUGAR SC1011
 Eluent: H₂O
 Flow rate: 0.6mL/min
 Detector: RI
 Column temp.: 85°C

Our technologies

- Surface modification technology
- Gel synthesis technology

The interaction of each ingredient in the sample and the gel filled in the column causes separation.

Polymer gel manufacturing technology



- Gel size control
- Fine pores size control
- Fine pores quantity control
- Surface hydrophobicity control

Gel synthesis

Monomer selection

- Styrene
- Methacrylate
- Vinyl alcohol
- N-vinyl acetamide

Surface modification

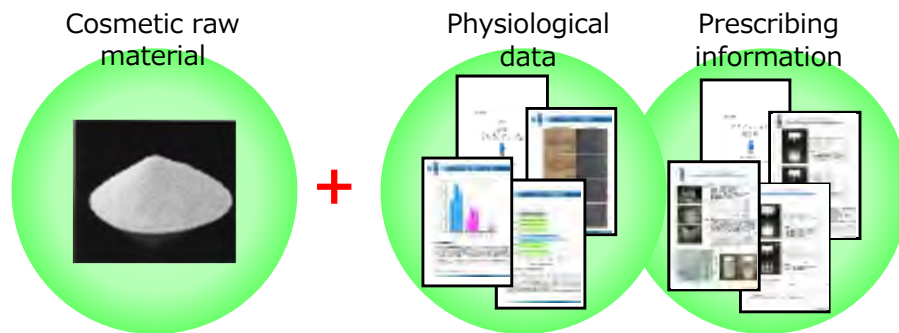
Selection

- Alkylation
- Alkoxylation
- Halogenation
- Sulfonation
- Carboxylation
- Amination
- Affinity ligand

Gel

Product Example

The products feature functionality and high quality. Both physiological data and prescribing information can be provided together.



Stabilized vitamin C derivative, amphipathic vitamin C derivative, water-soluble vitamin E derivative, amphipathic carnitine derivative, etc.

These materials are contained in various quasi-drugs and cosmetics both in Japan and abroad and help improve the quality of life of users.

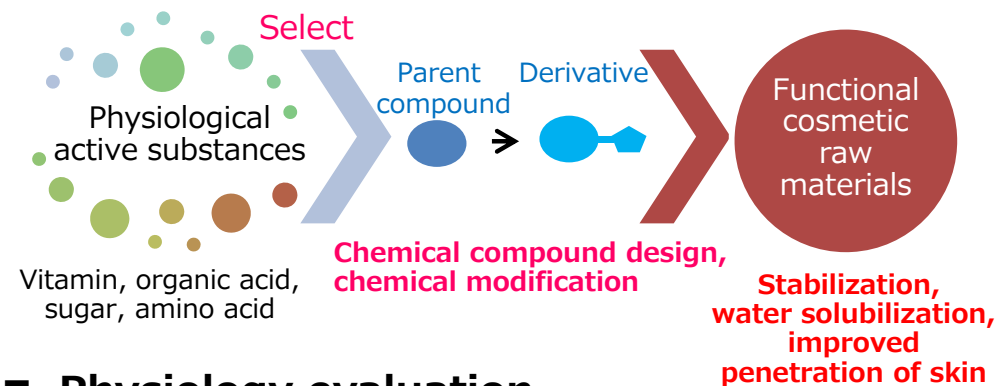


Our technologies

■ From chemical compound design to industrial production

We can create high functional derivatives from a parent compound with a highly safe physiological active substance.

We also own the technology to produce such derivatives on an industrial scale.



■ Physiology evaluation

We own the technology to evaluate functional cosmetic raw materials created using biochemical techniques based on dermatology.

■ From properties to prescription

We offer a range of services, from product property analysis to prescription examination.

