



Bringing New Value for Chemicals

Cellulose Nanofiber composite material

LUNAFLEX[®]

Strong Beautiful Flexible

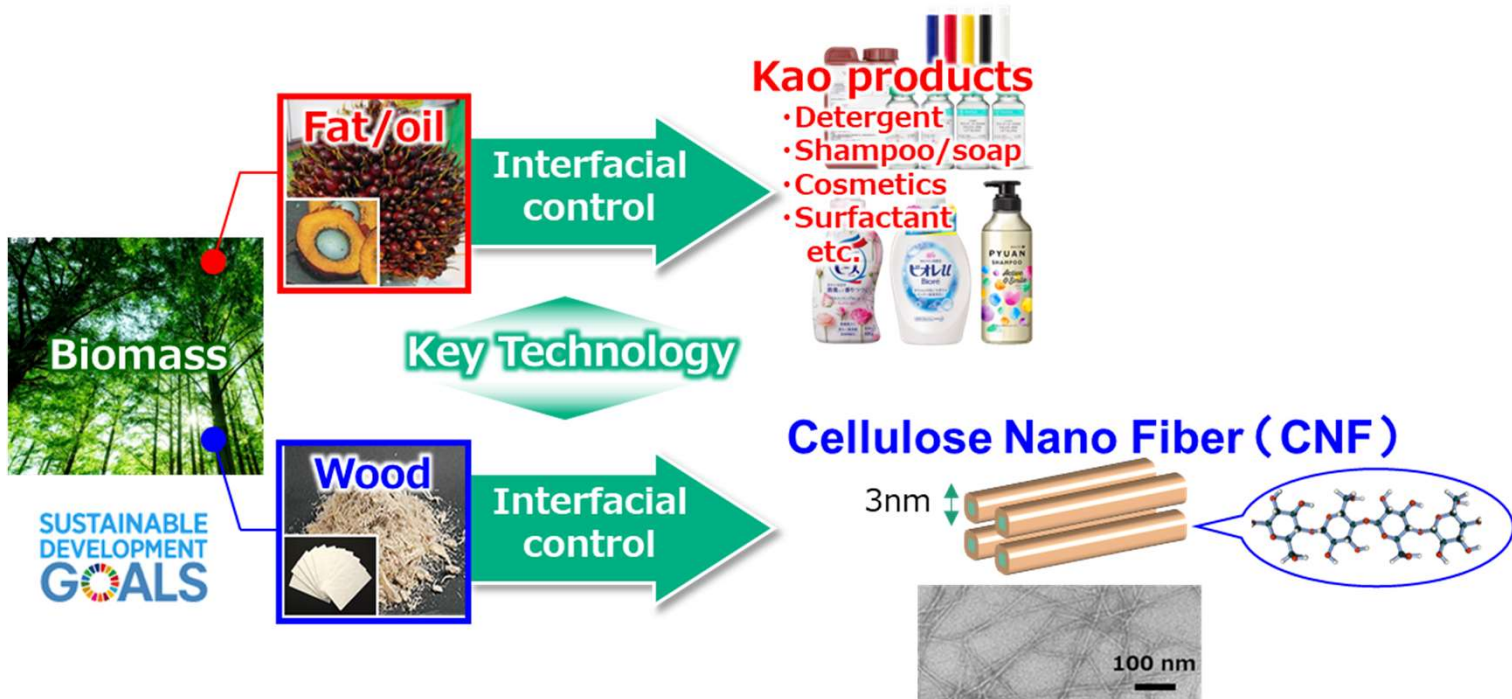


Our sustainable chemicals contribute to technological innovation for social sustainability.

Kao's chemical business provide a wide range of chemical products, oil and fat products manufactured from natural oil raw materials, functional materials such as surfactants, and specialty chemical products such as pigment inks for water-based inkjets. We are expanding them globally and contributing to rich lifestyles through a wide range of industrial fields.

In addition, we continue developing innovative products that reduce environmental impact by utilizing our interfacial science technology to create a sustainable society.

Contribution of chemical business to the environment



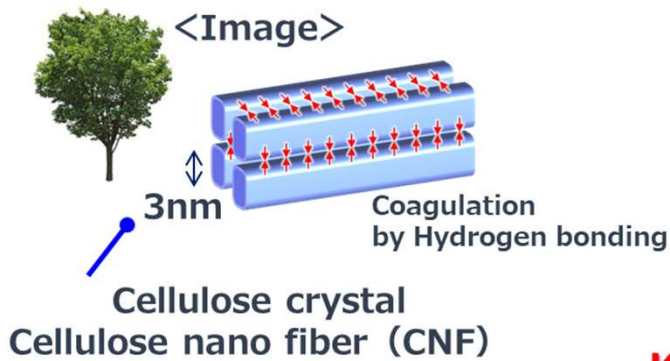
What is CNF "Cellulose Nanofiber" ?

CNF is a highly functional biomass material obtained by wood fibers. Tempo catalyst method CNF can make the nanofiber which the fiber width is 3nm uniform. It can be expected to improve dimensional stability, mechanical properties, and specific viscosity, etc.

Kao's modified CNF technology can disperse CNF uniformly in resins and solvents.

Kao's modified CNF technology

Contributing to the expression of CNF's original functions by achieving uniform nano-dispersion of CNF



Structure

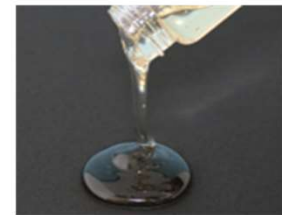
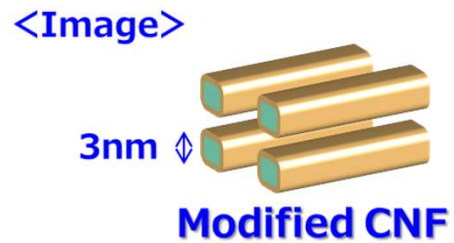
- ✓ Nano fiber diameter (3nm)
- ✓ High aspect ratio
- ✓ High crystallization

機械特性

- ✓ High modulus (similar steel)
- ✓ Low expansion (1/10 of glass)

Kao technology

- Surface modification
- Nano dispersion



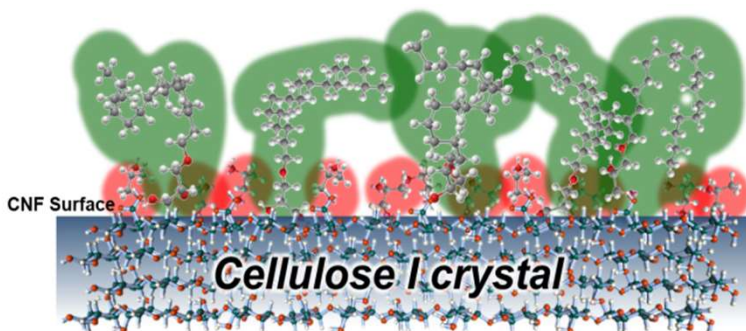
Nano dispersion in Resin or Organic solvent

"LUNAFLEX"
Sustainable nanomaterial

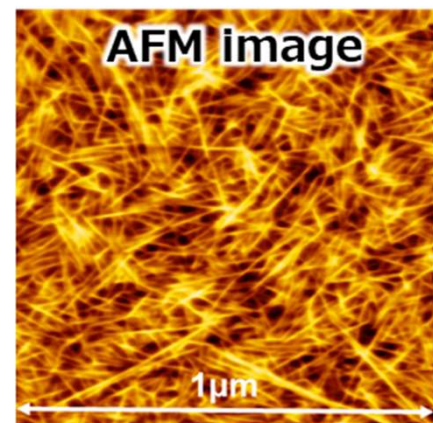
Kao's CNF interface control technology

<Dual graft system>

- 1) Expressing repulsive force
- 2) Improving affinity



<Nano dispersion of modified CNF>



Kao's surface modification and dispersion technology achieves uniform CNF dispersion to hydrophobic media.

Features of LUNAFLEX®

LUNAFLEX® is a custom-made development product that solves customer issues. Functions of CNF can be maximized only when CNF dispersed uniformly. We can customize the modified CNF according to the type of resins/solvents.

By uniformly dispersing modified CNF into resins/solvents...

- ✓ **Low CTE**[※] provides high dimensional stability (control heat shrinkage)
- ✓ **Improve resin strength** as a reinforcing fiber
- ✓ **Shear thinning** : Rheology control by our own technology

※ Coefficient of Thermal Expansion

LUNAFLEX is applicable to thermosetting resins such as epoxy resin and photo-curable resins such as acrylic resin.

Performance examples of LUNAFLEX® resin molded body

Epoxy resin

confidential

Photo-curable acrylic resin

confidential

Dispersion and viscosity control technology for organic solvents

confidential

If you need more technical information...

You can request the further technical information through the “Inquiry” page on Kao’s LUNAFLEX® WEB site.



Kao

Kirei—Making Life Beautiful

FOR YOUR PROTECTION

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