SANYO PRODUCT TOPICS

Fast Curing Solvent-free Inks and Coatings

"Photocuring" technology, which was initially used in the field of hard coating, including floor materials and furniture, is now widely used in electronic materials as well. In recent years, it has also attracted attention for applications in the fields of coatings and inks, with an aim to eliminate the use of solvents due to their harmful effects on the environment.
This article introduces the products and technologies related to photocuring.

Technology to induce polymerization by irradiating light on resin

Photocuring technology induces the polymerization and curing of materials by irradiating synthetic resins. A substance that is cured through photocuring is known as a "photocurable resin." Photocuring can be roughly classified into "photocationic polymerization" and "photoradical polymerization" based on the polymerization method.

Photocationic polymerization induces polymerization by irradiating ultraviolet (UV) rays and generating an acid (cation) from the photoinitiator present in the photocurable resin. Meanwhile, photoradical polymerization can be classified into two types: The first type induces polymerization by irradiating UV rays and generating radicals from the photoinitiator present in the photocurable resin, whereas the second type induces polymerization by irradiating an electron beam (EB), which has higher energy and generates radicals directly from the monomers. The polymerization method and the light source to be irradiated are selected according to the intended use to take advantage of the characteristics of each type of polymerization method.

Monomers that comprise photocurable resin possess "functional groups," which act as the starting point of polymerization, and curing occurs as these functional groups are linked together. Monomers are classified into monofunctional monomers, which form one-to-one connections, and polyfunctional monomers, which become connected to one or more other monomers. The hardness after curing increases for polyfunctional monomers due to more connections. In 1986, Sanyo Chemical Industries released "NEOMER" as a polyfunctional monomer for use in photoradical polymerization. Thereafter, we have released "SANRAD," a photocurable resin system, which is a compounded product using "NEOMER," among others, and it has been highly recognized for many years.

Photocurable resins allow the elimination of solvent use in coatings and inks

Photocurable resins have excellent surface curing, and thus, they were initially used such as for the surface treatment of building materials including floor materials and furniture. However, in recent years, they have been widely used in electronic materials, such as displays, due to their dimensional stability during cure and easy processing.

These photocurable resin technologies have been adopted in other fields as well due to environmental and other considerations. One such field is coatings and inks. Although they have already been used in the field of coatings and inks in relatively high-end printed materials, such as posters and stickers, where gloss and good color development are required, photocurable resins that do not use solvents have recently attracted attention from the viewpoint of the global movement toward the elimination of solvent use. Sanyo Chemical Industries is also conducting developments to expand the application of "SANRAD," a photocurable resin system, in this field, through the use of a technology we cultivated in the development of products for electronic materials.

New VOC regulations and reduced solvent use in China

Organic solvents present in coatings and inks are sources of volatile organic compounds (VOCs), which significantly impact the human body and the environment. Therefore, efforts to reduce the use of organic solvents have been promoted in this field.

These efforts started with trends away from toluene and xylene, development of new high-solids formulations and, ultimately, development of aqueous products that use water instead of organic solvents. Sanyo Chemical Industries has also developed and marketed several products, including water-based coatings and inks, corresponding to these products.

Under these circumstances, in China, where environmental regulations are being enforced more strictly, the national mandatory standards for VOC limits and other details will be applied as a measure against air pollution, with coatings as the target starting in December 2020 and inks starting in April 2021. Coatings and inks are widely used, and these regulations also cover adhesives and cleaning agents, which affect many business operators. In addition to the products produced and sold in China, products that are

produced in Japan and exported to China are also covered, such as coating products; therefore, the concerned business operators are required to take prompt actions.
Therefore, photocurable resins that can achieve beautiful coating and printing without solvents, in addition to aqueous coatings and inks, have attracted a lot of attention.

Photocuring technology that can greatly contribute to SDGs

The adoption of aqueous formulations is the current focus in the field of coatings and inks; however, aqueous products still suffer disadvantages in drying and adhesive properties in the field of inks, where mass printing on flat paper and film is required.
In contrast, UV inks using photocurable resins allow fast curing in the printing process, where paper or film is wound quickly. Also, they outperform aqueous inks from the viewpoint of drying properties and adhesive properties. Thus, they are receiving a lot of attention, including the UV ink-jet printing method.
In addition, photocurable resins are solvent-free and do not require heat to dry like aqueous inks, and therefore, they are superior in CO_2 reduction and can be considered environmentally friendly.

As described above, photocurable resins are products that can contribute to various SDGs, including No. 3, "Ensure healthy lives and promote well-being for all at all ages"; No. 9, "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation"; No. 11, "Make cities and human settlements inclusive, safe, resilient and sustainable"; No. 12, "Ensure sustainable consumption and production patterns"; and No. 13, "Take urgent action to combat climate change and its impacts."
Sanyo Chemical Industries will continue to provide functional monomers such as "NEOMER" and photocurable resin systems such as "SANRAD" that apply them, and contribute to the SDGs.

■Additives for Water-based Coatings.

Name of product		CARRYBON L-400	SANMORIN OT-70	CHEMISTAT 3500	NAROACTY CL Series	IONET T-20C
Type of additive		Dispersant	Dispersant	Dispersant/ antistatic agent	Dispersant	Dispersant
Type of surfactant		Polycarboxylate-based anionic surfactant	Sulfosuccinate-based anionic surfactant	Anionic surfactant	Nonionic surfactant	Nonionic surfactant
Description	Appearance	Brown liquid	Light yellow liquid	Light yellow paste	Colorless to light yellow liquid, white to light yellow solid, white flakes, etc.	Yellow liquid
	Active ingredient	43%	70%	97%	100%	97%
	Specific gravity (25°C)	1.3	1.08	1	—	1.11
	Viscosity (25°C)	450 mPa·s	—	550,000 mPa·s	—	—
	Pour point	-20°C and lower	-5°C and lower	5°C and lower	—	0°C and lower
	pH (1%)	7.6	6	8.2	6.5	—
Features/applications		• Polymer-type dispersant with excellent dispersibility of inorganic pigments (calcium carbonate, clay, etc.) • Delivers pigment dispersion with good viscosity stability in time. • Excellent viscosity reduction capability.	• Suitable for aqueous and emulsion coatings. • Provides high wettability to hydrophobic pigments.	• Excellent dispersibility of pigments such as titanium oxide. • Provides excellent antistatic properties to coatings, inks, etc.	• Synthetic alcohol-based nonionic surfactant. • Alkylene oxide adducts with narrow molecular weight distribution and high surface activity. • Available in different grades with different addition mole numbers of alkylene oxide, and has excellent pigment dispersibility.	• TWEEN-type surfactant. • Excellent dispersibility of pigments in aqueous coatings.

Please contact the sales representative of our company when handling our company's products. It is also necessary to read the "Safety Data Sheet" (SDS) in advance. It is the responsibility of the user to determine the suitability and safety for the intended use.