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Sanyo Chemical Industries, Ltd.

Development of radical polymerization-type UV curing resin system Curable up to the shielded part being not exposed with the light

Sanyo Chemical Industries, Ltd. has developed a radical polymerization-type UV curable system even in a state being not exposed with the light (shielded) by using an original initiator. Conventionally cation polymerization type is the only one method as the UV curing system to be capable of curing up to the shielded part. Wherein there are some restrictions: the curing is slow and kinds of available monomers are constrained, etc. Our new system realized to be capable of curing up to the shielded part while maintaining the advantage of radical polymerization type, such as the rapid curing and a variety of the available monomers.

【Background】

Generally curing resin needs to be heated (thermosetting) or volatilized a solvent, etc. On the other hand, UV curing resin, which is curable by only being irradiated UV ray, is widely used as an environmentally friendly one, because it is unnecessary heat or solvent to cure. Especially it came to use and became essential in the fields of coating, inks, adhesives and electronics materials, where heating is impossible or non-solvent is needed. Examples are the adhesive for the cover glass of a smart phone or the liquid crystal sealant.

Radical polymerization-type: main type of UV curing resin has the defect of its characteristics, that the shielded part cannot be cured. Radical polymerization progresses by generating a short-life radical from an initiator and its reaction with monomers around. Therefore the resin isn't cured when shielded (Figure 1: left).

Cation polymerization-type UV curing resin is known as the resin being capable of curing shielded part. But the curing is slow and it is lack of versatility due to its limited kinds of the monomers available (Figure 1: right). The one that can cure up to the shielded part with high curing speed and variety of available monomers is needed.

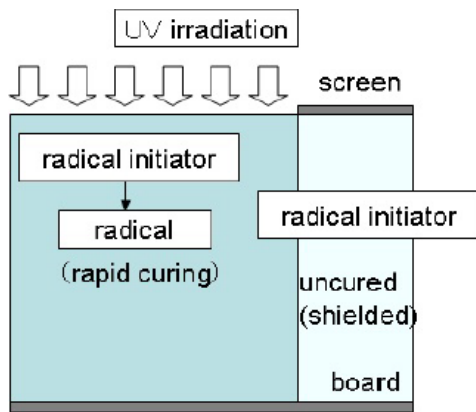


Figure 1: left
Conventional radical polymerization
(shielded part is uncured)

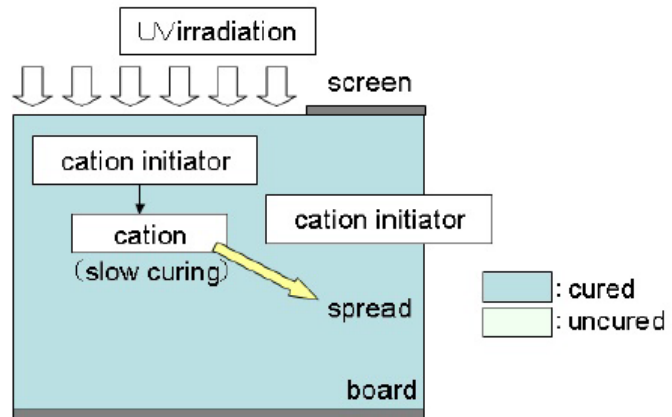


Figure1: right
Cation polymerization
(shielded part is cured but slow curing and application is limited)

【Abstract of the new technology】

Conventional radical polymerization-type UV curing resin generated a radical from the initiator exposed with UV light; whereas the new technology generates long-life active compound working on radical initiators. It results in generating radicals indirectly. The active compounds spread in the system regardless of presence/absence of UV irradiation and work on the initiators in the shielded part. This can cure the resin even in the shielded part (Figure 2: right). Besides, the advantage of the radical polymerization is maintained, such as rapid curing and having excellent adhesion property because of a variety of available monomers.

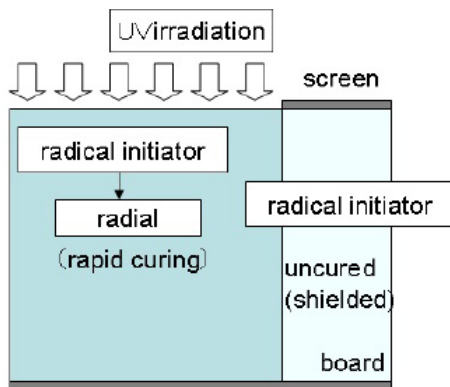


Figure 2: left
Conventional radical polymerization
(shielded part is uncured)

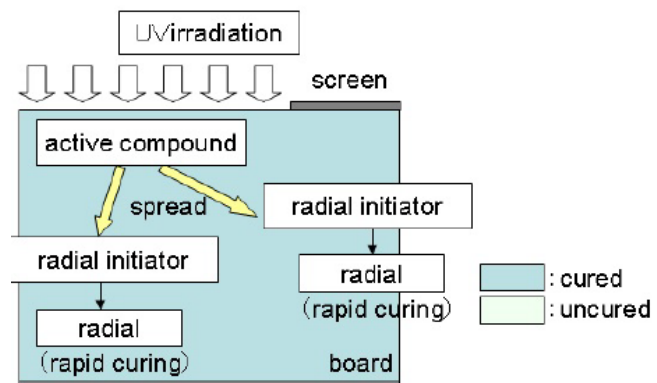


Figure2: right
Developed radical polymerization-type UV curing system
(cured up to shielded part with high speed and versatility)

Furthermore this system is able to cure such a resin which is hardly irradiated with light uniformly in the case of containing highly concentrated pigments or fillers. If this system apply to conductive paste with highly concentrated conductive fillers (copper / silver, etc), it is applicable to metal plating for wiring of touch panels. Using these characteristics, but not limited to existing fields where the UV curing resins are already used, it would enable to develop into the new fields such as automobiles, coatings for buildings and printing field.

【Future plans】

We could formulate the resins with the kinds of monomers, viscosity, curing speed and hardness to meet the user needs. We are trying to commercialize this system depending on the specific purposes of users.