

# STAR Technology

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## Safety and Handling of UV Materials

### **Introduction:**

Ultraviolet (UV) curing has been recognized as a successful low to zero VOC coating and adhesives technology for over 25 years. However, many misconceptions still exist concerning the safety of the materials and equipment used in UV curing. Such misconceptions have overshadowed the fact that UV materials are, in general, less hazardous and easier to control than most solvents. In some cases, a misunderstanding of safety issues has blocked adoption of this powerful compliance technology.

### **Physical Hazards of UV Technology**

The biological effects of ultraviolet radiation result mostly from exposure to wavelengths below 325 nm and resemble the typical symptoms of sunburn:

Skin: redness, dryness, wrinkling

Eyes: inflammation, pain, photophobia, tearing, temporary blindness, cataracts.

These hazards are minimized by basic engineering, administrative and hygiene controls. Curing equipment is provided with shielding to minimize escape of UV light into the workplace.

Eye protection materials should absorb UV light to prevent unintended exposure and eye irritation exposure and eye irritation. Never look directly at the UV lamps or strong reflections, even with eye protection. Never adjust UV shielding without qualified supervision.

Ozone is a pungent smelling, irritating gas which is generated by reaction of atmospheric oxygen exposed to UV radiation. The physiological symptoms of exposure include respiratory irritation, fatigue and headache. Proper ventilating equipment minimized this hazard in the workplace.

### **Toxicity of UV Curing Materials**

In general, UV curing acrylates have low systemic toxicity, but they can cause skin and eye irritation or even chemical blister burns on prolonged direct contact.

The immediate dermatitis effect which can occur when formulations containing acrylates are mishandled and acts as a warning that handling procedures must be improved. Unfortunately, it also raises concerns about working with these materials, because the consequences of poor hygiene practices are so noticeable. Solvent systems often do not have such short term warning properties, even though the consequences of poor industrial hygiene practice can be severe. As a result, UV curing systems may incorrectly be perceived as more hazardous than conventional technology.

### **Minimizing the Risk of Dermatitis**

Most people can work safely with UV curing materials by using the proper protective clothing and handling procedures. It is important to remember that UV curing materials do not evaporate, so spills and incidental contamination will remain until cleaned up.

The type of protective clothing recommended depends on the type of potential exposure. Typically, fabric or non-woven long sleeved, full leg clothing or coveralls are worn. Rubber gloves always are worn when direct contact with the materials is possible, and these should be selected to be resistant to prolonged contact with cleaning or diluting solvents. Barrier creams can be used to facilitate washing off any material which might penetrate gloves or other protective clothing. Barrier creams should be applied to clean skin and should not be applied after exposure. A rubber apron or rubber suit is appropriate when there is the possibility of being splashed with solvent or corrosive materials. Protective clothing contaminated with small amounts of UV curing materials can be laundered in an alkaline detergent and reused. Always launder at a commercial Laundry; do not take contaminated clothing home for cleaning. If protective clothing becomes heavily contaminated, it should be properly discarded.

Since UV/EB curing materials do not dry out or cure under normal ambient conditions, they remain liquid and can be cleaned up easily with less aggressive solvents, such as soap and water. Solvents can be used for cleaning equipment, but only if the appropriate protective clothing is worn. Solvents should not be used to wash the skin, because they may increase the possibility of penetration of chemicals into the skin, and dermatitis may occur.

Wear safety glasses or other adequate eye protection whenever handling any type of chemical. A full face shield is appropriate if splashing is likely.

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## Regulatory Considerations

Most UV curing materials are not regulated by DOT as flammable or corrosive. Exceptions are styrene and BCEA, which has a high content of combustible and corrosive acrylic acid. With these exceptions, and unless diluted with flammable solvents, UV curing materials generally are not "hazardous waste" (toxic, corrosive, flammable, or reactive) as defined under RCRA regulations. However, as with all chemicals, contaminated materials and wastes should be disposed of in accordance with federal and local requirements.

UV curing materials contain little to no VOC's and no "HAPS." They are not currently specified in any federal or state Community Right-To-Know list.

## Conclusions

Early inexperience with handling acrylates and poor work habits resulted in cases of occupational dermatitis. These incidents and early toxicity testing reports generated concerns and some misconceptions about the safety of UV curing technology. Subsequent testing has shown that earlier concerns about acrylate toxicity were overstated. UV curing materials have low systemic toxicity, and acrylates as a class cannot be assumed to be carcinogenic via dermal exposure. Products with unusually severe irritation characteristics have been eliminated from commercial use, and new, less irritating materials are available for formulating UV curing systems. Good industrial hygiene practices, knowledge of safe handling procedures and worker training are essential for safe handling of any chemical. When these principles are followed, experience has shown that UV curing technology can be handled safely in industrial applications.

In general, UV curing materials are less hazardous than solvents in the work environment.

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