Safe Handling of UV Materials

What is Product Responsibility?

Product Responsibility means protection of the environment, health and safety (EHS) in every aspect of product manufacture, use and disposal, i.e. life cycle management. 3M's product responsibility principles and practices support our fundamental corporate values, help achieve both legal compliance and ethical business conduct, and contribute to successful product commercialization and customer satisfaction.

Life Cycle Management (LCM) is one process used at 3M to help understand and manage the environmental, health and safety (EHS) impacts. LCM stresses the efficient and safe use of resources in 3M products throughout their life cycle to guide responsible design, development, manufacturing, use and disposal.

About this Document

This document is not intended as a substitute for obtaining, reading and following the appropriate MSDS, the 3M Product and Instruction Bulletins for the ink series you are using, or the instructions provided by the manufacturer of any other equipment of chemicals used.

⚠ Caution

When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information. To obtain MSDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

Read and follow the most current 3M Product and Instruction Bulletins for the ink series you are using. They are available at 3Mgraphics.com.

Introduction

For many years, ultraviolet (UV) curing has been successfully used as an environmentally friendly, low-VOC coating and adhesive technology. UV materials can be handled safely as long as the proper handling/training and industrial hygiene practices and engineering controls are utilized.

UV curing materials contain little to no VOCs and typically contain no hazardous air pollutants (HAPS). They are not typically specified in any federal or state Community Right-to-Know list.

Incomplete curing of the printed (or cleared) substrate can cause uncured components to be present on your graphic. Substrates where inks can penetrate below the printing surface may be difficult to adequately cure. Please take the appropriate measures to ensure that your graphic is fully cured.

Handling

In general, acrylates found in UV materials tend to be on the high side of the irritation scale. Clearly defined work procedures and effective worker training are essential when working with these materials. Safe handling principles may prevent an allergic skin reaction, or in certain individuals, sensitization over time. Experience has shown that good procedures and worker training in handling and industrial hygiene practices enable UV curing systems to be used safely in a wide range of industrial applications.

As with any chemical, food and beverages should not be consumed in areas where UV curing materials are handled.

Minimizing the Risk of Contact

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. For example, equipment touched with contaminated gloves can be the source of exposure if touched later by unprotected skin. Always remove any contaminated personal protective clothing prior to leaving the work area.

Protective Clothing

The type of protective clothing recommended depends on the type of potential exposure and materials involved. The typical clothing would include:

- Woven or non-woven, long-sleeved, full-leg clothing or coveralls should be worn.

- Gloves should always be worn when direct contact with materials is anticipated. They should be selected to be resistant to prolonged contact with UV materials and cleaning or diluting solvents. Follow the glove manufacturer recommendations for glove changeout or consult with your EHS representative. Barrier creams can be used with gloves. They should not be used alone to provide protection. Barrier creams should be applied to clean skin and not applied after exposure.

- A rubber apron or rubber suit is appropriate when the possibility of splashing with solvent or corrosive materials exists. Frequent washing of the hands and arms with soap and water is a good practice.

- Shoes must provide full foot coverage. Rubber boots should be worn when there is a possibility of working in solvent or liquid chemicals or in situations when a bulk spill could occur.

Exposure

Physical Contact
Skin and eye exposure are the primary concerns when working around UV light sources.

UV curing acrylates can cause skin irritation, dermatitis and chemical burns or blisters after prolonged contact. Some individuals may become sensitized as a result of contact with UV materials. If sensitization occurs, immediate removal of the individual from the exposure areas is recommended.

Refer to the MSDS for additional details.

Ozone Generation

UV-curing units create energy and can also cause oxygen in the air around the curing zone to form ozone. High concentrations of ozone can cause shortness of breath, coughing, wheezing, headaches, nausea, and eye and throat irritation.

Ensure that there is adequate ventilation and extraction of air from the curing area of the UV dryer. Curing units typically come with ventilation fans. However, it may be necessary to install supplemental extraction fans in the ventilation system or remove the oxygen from the curing zone of the dryer. Consult a qualified local industrial hygienist.

UV Curing Lamps

Ultraviolet light from a commercial UV curing lamp is considered carcinogenic. Shielding is required to protect workers and bystanders from the UV rays. Manufacturers of equipment normally include such shielding in their designs.

Odor

The only byproduct of the UV lamp is ozone gas. It has a pungent sweet odor and is distinctive enough that concentrations well below the threshold limit value (TLV) of 0.1 ppm are noticeable. At high enough concentrations, ozone gas and odors can cause headaches and fatigue. After repeated exposure at high concentrations, ozone can cause dryness of the upper respiratory tract, pulmonary irritation and possibly respiratory infections. Exposure to ozone gas can easily be avoided with spot collectors and proper ventilation adjacent to the UV curing unit as well as with lamps to draw the ozone away from the operators.

Most UV curable materials are based on acrylate resins, which have a distinctive smell. Odors are not necessarily a cause for concern. Relatively nonhazardous materials can have a strong odor, and conversely very hazardous materials can be odorless. Although odiferous materials can be a nuisance in the workplace, odor is usually not a concern unless the material detected is an inhalation hazard. To minimize odors, the work place and associated equipment should have proper ventilation maintained to the material supplier's specifications. Air flow tests can be easily conducted to determine equipment status. The acrylates in UV materials typically have low odor thresholds and, therefore, their odors are detected at very low concentrations.

Material Transfer and Storage

Equipment which minimizes direct contact with workers should be used for material transfer whenever possible. UV curing materials should be stored in containers which prevent exposure to light and UV sources and should be kept away from oxidizing agents, acids, alkalis, catalytic metals and polymerization initiators.

Waste Disposal

Incineration is the most viable method used. Users should find a reputable, approved company to handle incineration. Unless diluted with flammable solvents, UV curing materials generally are not "hazardous waste" under RCRA regulations. However, as with all chemicals, contaminated materials and wastes should be disposed of in accordance with federal, state and local requirements.

Contaminated Clothing

Consult your MSDS for proper disposal considerations. Also consult your local waste disposal authorities for guidance.

If you get UV materials on your skin or clothing, immediately remove all contaminated clothing. Wash the affected skin areas thoroughly with mild soap and water or with materials specially designed for that purpose. Do not use abrasive cleaners. Solvents should not be used as they may increase the penetration of monomers into the skin. Continue to flush the skin with lukewarm water for 15 minutes to ensure the material is completely removed.

Contaminated work articles or clothing should be thoroughly cleaned or discarded. Protective clothing contaminated with small amounts of UV curing materials can be laundered in an alkaline detergent and reused. If protective clothing becomes heavily contaminated, it should be properly discarded. Use of an industrial laundry equipped to handle chemical residue is recommended. Do not take contaminated clothing home for cleaning.

Contaminated shoes, belts, or other leather goods cannot be decontaminated to allow safe use and should be discarded.

Clean-up

Because UV 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 or citrus and vegetable oil cleaners. 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. Hand creams should be used to prevent irritation of the skin due to frequent washing.

Conclusion

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, UV curing technology can be handled safely in industrial applications.

Disclaimer

This bulletin conveys environmental, health and safety information for a product. The information provided is accurate to the best of our knowledge but is not intended to be exhaustive. Distributors and users of 3M products remain responsible for complying with all applicable laws and regulations.

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