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UV-cured inks: Chemical category findings

This chapter focuses on health concerns related to the three UV-cured ink product lines in the flexo ink study.

Only *uncured* inks only were analyzed in this study, because adequate data about emissions from inks after curing were not available. Given that most of the volatile components of UV-cured inks react chemically during curing and are incorporated into the coating, *it is reasonable to expect (but not known for certain) that air emissions from these inks would be substantially lower in practice.*

The use of UV-cured inks in wide-web flexo was a newly developing technology when the study was designed. Technology advances since that time might result in different findings if the study were repeated today.

General population

No chemicals with *clear concern* to people living near a printing facility were identified in the UV-cured ink systems that were studied, and most chemicals presented a negligible concern. Acrylated polyols in one product line (serving as reactive diluents) contained chemicals of *potential risk concern*. Certain amides or nitrogenous compounds and acrylated polyols also may present a potential risk.

Flexo workers

Table 10 shows the chemical categories in UV-cured inks that were predicted to pose a clear risk concern for workers under the conditions of the study. Chemicals in acrylated polyols (used as UV-curing compounds) were found to pose a clear risk more often than any other chemical category in UV-cured inks. Acrylated polyols and amides or nitrogenous compounds showed clear concern for both inhalation and dermal exposure. The other categories (acrylated polymers, organometallic pigments, and organophosphorus compounds) showed dermal risks only.

Many chemicals used in UV-cured inks have incomplete toxicology data. More research is needed to better understand possible health and environmental impacts.



Chemicals in these categories were predicted to drive worker health concerns. When assessing inks at a flexo facility or developing new formulations, you might start with these categories.

TABLE 10 Clear Occupational Health Risk Concerns for UV-Cured Inks

Chemical Category of Clear Risk Concern*	Function in Ink	Exposure Route**
Acrylated polyols	UV-curing compounds	dermal, inhalation
Acrylated polymers	UV-curing compounds	dermal
Amides or nitrogenous compounds	Multiple	dermal, inhalation
Organometallic pigments	Colorants	dermal
Organophosphorus compounds	Multiple	dermal

*These chemical categories might be associated with different risks, or with no risk at all, under different study conditions. A category is included in the table if at least one chemical in the category posed a clear risk under the conditions of the study. Not all chemicals in these categories were found to present risk concerns.

**Only pressroom workers were assumed to have exposure via inhalation. Both prep-room and pressroom workers were assumed to have dermal exposure.

TSCA Section 5 and Acrylate Esters

A Significant New Use Rule (SNUR) was proposed for acrylate esters, which are found in some flexographic ink formulations. However, EPA withdrew the proposed SNUR after receiving, under the terms of a voluntary agreement, toxicity data from acrylate manufacturers that determined that neither triethylene glycol diacrylate nor triethylene glycol dimethacrylate were considered carcinogenic. As a result, EPA no longer supports the carcinogen concern for acrylates as a class. However, EPA may still regulate and maintain health concerns for certain acrylates on a "case-by-case" basis when they are structurally similar to substances for which EPA has supporting toxicity data or when there are mechanistic/toxicity data supporting the concern. Data from experimental studies show some acrylates can cause carcinogenicity, genotoxicity, neurotoxicity, reproductive and developmental effects, and respiratory sensitization. For dermal exposure, EPA continues to recommend the use of protective equipment, such as impervious gloves and protective clothing, for workers exposed to new or existing acrylates and methacrylates. For inhalation exposure, NIOSH-approved respirators or engineering controls to reduce or eliminate workplace exposures should be used. EPA continues to evaluate the acrylate chemical category for ecotoxicity.