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Please visit the Banks Harris page at <http://www.ala.org/alcts/awards/profrecognition/banksharris> for more information.

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# Health & Safety

## Pigment Health & Safety Quick Guide

### INTRODUCTION

This pigment quick guide is intended as an introductory reference to health and safety issues for common pigments, but should not be used as a definitive resource. Conservators are encouraged to check the current Safety Data Sheet (SDS) or Material Safety Data Sheet (MSDS) for each material. For a guide to understanding SDS, see OSHA's Hazard Communication Standard: Safety Data Sheets (OSHA 2012). The SDS/MSDS for artist materials can be surprisingly incomplete and may differ from one manufacturer to another, so conservators should pursue other sources for current information; Monona Rossol's book, *The Artist's Complete Health and Safety Guide* (Rossol 2001), is an excellent resource. The toxicity and handling recommendations for solvents, binders, driers, fillers, and other components in commercially pre-mixed paints are not considered here, but should also be taken into consideration (IARC 2012). Many artists' materials have not been extensively studied or tested and existing toxicology data may be incomplete. If no information is available, the material should be treated as unsafe. The Pigment Health & Safety Quick Guide includes a chart detailing the health hazards associated with common pigments and a table of the Hazards of Metals and Metal Compounds. Both resources are linked to this guide.

### ROUTES OF ENTRY

Pigments may enter the body through skin or eye contact, ingestion, or inhalation. Depending on the material, one route of entry may be more hazardous than another. It is important to practice good hygiene and wear appropriate personal protective equipment to reduce risk of exposure. Many pigments manufactured after the early 1970s are in nanoparticle size. It is unknown if some of these nanoparticle-sized pigments are capable of absorbing whole through the skin or what their effects might be (Rossol 2017). Pigments may cause allergic reactions, irritation of the eyes or skin, or more serious reactions.

### DRY PIGMENTS

Working with dry pigments increases risk of exposure via inhalation. Smaller particles pose a greater health risk as they penetrate more deeply into the lungs and may be absorbed more readily into the body (Rossol 2001). Even pigments such as the earth colors (e.g. green earth, iron oxides) may cause chronic irritation of the respiratory tract through prolonged or repeated exposure, and many pigments may include toxic contaminants that could cause more serious health issues. It is important to use appropriate personal protective equipment and to practice good hygiene to reduce risk of exposure. Inhalation risk can also be mitigated by working with pigments that are already mixed with a binder.

### METALS

Pigments containing lead, mercury, cadmium, chromium, arsenic, nickel, or antimony should be avoided or used with caution, as should materials containing cobalt, manganese, and selenium (US EPA and Pratt Institute 2006). These metals pose serious health risks as they can be highly toxic, even



## Health & Safety Issues in Natural Disasters

From the AIC Health and Safety Committee our hearts go out to all individuals, family, and friends whose lives are being impacted by Hurricanes Harvey, Irma, and Maria. The AIC Health and Safety Committee is here to help with any questions you may have about health and safety concerns.

Here are some resources we hope might be useful:

- American Industrial Hygiene Association, "Health and Safety Issues in Natural Disasters" [https://www.aiha.org/government-affairs/PositionStatements/AIHA\\_IH\\_Disaster%20FinalJuly72017.pdf](https://www.aiha.org/government-affairs/PositionStatements/AIHA_IH_Disaster%20FinalJuly72017.pdf)
- AIC H&S Committee's article "Health and Safety in Emergency Response" [http://www.conservation-wiki.com/w/images/9/92/H%26S\\_Health\\_%26\\_Safety\\_in\\_Emergency\\_Response\\_2016.pdf](http://www.conservation-wiki.com/w/images/9/92/H%26S_Health_%26_Safety_in_Emergency_Response_2016.pdf)

Please stay safe and well.

If you have questions about health and safety contact us at: [health-safety@conservation-us.org](mailto:health-safety@conservation-us.org).

Articles, brochures and other information available on our website and wiki:

- [www.conservation-us.org/healthandsafety](http://www.conservation-us.org/healthandsafety)
- [www.conservation-wiki.com/wiki/Health\\_&\\_Safety](http://www.conservation-wiki.com/wiki/Health_&_Safety)

in small quantities; most are known or suspected carcinogens. Also, nickel is now classified as a human carcinogen (IARC 2017). Small amounts of the metals may build in the bloodstream leading to damage of the liver, kidneys or other organs, nervous system damage, and other serious chronic health issues. As a best practice, if pigments containing these metals are used in the lab, blood and/or urine tests should be done regularly in consultation with an occupational physician (AIC Health & Safety Committee 1999). In a workplace where lead is used, the OSHA Lead Standard must be followed, including testing at least once a year (OSHA 2012). Conservators should understand and adhere to all applicable legislation in their jurisdiction.

### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Always check the SDS/MSDS for information on personal protective equipment (PPE) for each material you use. It is best practice to always wear an apron or lab coat, appropriate gloves, eye protection, and respiratory protection. Particle size and toxicity should both be considered in evaluating risk and determining which respiratory protection to employ. Pigments today are usually in nanoparticle size, with the most common range of sizes between 0.04 and 0.06 nanometers in diameter. This means they may exhibit of some of the added toxic effects exhibited in tests of these very small particles (Rossol 2017). For most pigments that pose any health risks, it is best practice to use high efficiency respirator filters, P100, N100, or R100, which are 99.97% efficient (Colton 2016).

### RULES FOR WORKING WITH PIGMENTS AND DYES (ADAPTED FROM ROSSOL 2017)

- Whenever possible, use materials which do not expose you to pigments or dyes in the powdered state.
- Identify your pigments and dyes. Use only materials for which Safety Data Sheets are available and ensure Chemical Abstract Service numbers and/or Color Index names and numbers are given.
- Wear PPE suitable for the pigment you are using: gloves, eye protection, lab coat, and appropriate respiratory protection.
- Weigh out, slurry, mix, or handle pigments and dyes in local exhaust ventilation or in a glove box.
- Keep work area clean. Work on easy-to-clean surfaces and wipe up spills immediately. Wet mop or sponge surfaces and floors, or use HEPA vacuums. (Note that very fine particles may penetrate HEPA vacuum filters). Do not sweep.
- Practice good hygiene and do not eat, smoke, or drink in the lab.
- Label pigment containers in the same way you would any other chemical. Use tight fitting lids and keep containers closed when not in use.
- If pigments containing toxic metals such as lead, mercury, cadmium, chromium, and arsenic are used, blood tests should be done regularly for best practice and/or to adhere to applicable safety regulations.
- While conservators generally work with very small quantities of pigments, it is important to know that all finely powdered metals used as pigments should be considered flammable and/or explosive.

### DISPOSAL

Federal regulations in the United States are defined by the U.S. Environmental Protection Agency (EPA). Some state and local authorities may have more stringent regulations which would apply in addition to EPA regulations. There are several categories of hazardous waste generators defined by the EPA. Most conservators and conservation businesses are likely to fall into the category of Very Small Quantity Generators (VSQG), which generate less than 220 lbs. (100 kg) of non-acute hazardous waste; less than 2.2 lbs. (1 kg) of acute hazardous waste; and less than 220 lbs. (100 kg) of residues from the clean-up of a spill of acute hazardous waste per month (US EPA 2001). This definition includes not only pigment and paint waste, but also any solvent or other hazardous waste the conservator/ conservation business may generate. The EPA advises that conservators and conservation businesses that “meet the guidelines for VSQG on a monthly basis do not need to obtain an EPA ID number. In addition, these generators can send their hazardous waste to a variety of destinations for treatment or disposal including a hazardous waste treatment facility, a municipal waste facility, or a state-authorized facility for the management of hazardous waste. State and local requirements can be different, and some states do require that VSQG waste be shipped with a manifest and/or go to a RCRA-designated disposal or treatment facility. EPA does recommend that this waste be managed at a hazardous waste treatment or disposal facility whenever possible to ensure the protection of human health and the environment” (Environmental Protection Agency Spokesperson 2017).

### Abbreviations

<b>CAS</b>	Chemical Abstract Service Registration Number
<b>C.I.</b>	Color Index Number
<b>EPA</b>	Environmental Protection Agency
<b>IARC</b>	International Agency for Research on Cancer
<b>MSDS</b>	Material Safety Data Sheet
<b>OEHHA</b>	Office of Environmental Health Hazard Assessment
<b>OSHA</b>	Occupational Safety and Health Administration
<b>PPE</b>	Personal Protective Equipment
<b>RCRA</b>	Resource Conservation and Recovery Act
<b>SDS</b>	Safety Data Sheet
<b>VSQG</b>	Very Small Quantity Generator

## PIGMENT QUICK GUIDE CHART

The Health & Safety Committee has created a chart ([http://www.conservation-wiki.com/w/images/7/7c/H%26S\\_Pigment\\_Guide\\_Toxicity\\_Chart.pdf](http://www.conservation-wiki.com/w/images/7/7c/H%26S_Pigment_Guide_Toxicity_Chart.pdf)) to assist conservators in assessing the risks associated with common dry pigments. This guide is meant to be used in conjunction with other resources, including the SDS/MSDS for each material. With the exception of a few examples, dyes have not been included in the attached chart. The toxicology and long-term health effects of most dyes are not well known and, while some may be considered reasonably safe, others, such as some anthraquinones and those based on benzidine, are known or suspected carcinogens (Rossol 2001).

### PIGMENT IDENTIFICATION

Pigment names may differ from one manufacturer to another and it can be difficult to determine the composition for commercially available pigments. For greater consistency, use the Color Index Number (C.I.), which is standard across the industry, and check pigment composition if details are available. C.I. Numbers are given in the chart. Another option is to use the Chemical Abstract Service registration number (CAS) (Rossol 2001). Either way, be certain you know exactly what materials you are using!

### CARCINOGENS

Information on the carcinogenicity of materials is taken from the World Health Organization’s International Agency for Research on Cancer (IARC various) and California Proposition 65 listings (California OEHHA 2017). Lack of information in this column indicates only that the material is not listed by IARC or California Proposition 65 or that there is currently no data available. The absence of a carcinogenicity rating is more often due to the lack of sufficient testing and data than the absence of risk, so always approach materials cautiously and follow the rules for working for pigments.

**Table 1. Carcinogen Classification Descriptions (IARC 2017).**

IARC Classification	IARC Classification Description	Pigment Quick Guide Description of Carcinogenicity
Group 1	Carcinogenic to humans	Yes
Group 2A	Probably carcinogenic to humans	Probably
Group 2B	Possibly carcinogenic to humans	Possibly
Group 3	Not classifiable as to its carcinogenicity to humans	Not classifiable
Group 4	Probably not carcinogenic to humans	Probably not
	(not included in IARC monographs)	Not listed

### GENERAL TOXICITY INFORMATION

General toxicity information has been taken mainly from current SDS/MSDS, Rossol (2017) and McCann (2005). Again, it is important to emphasize that many of these materials have not been studied for long-term health risks and sometimes they have not been tested at all. On the SDS/MSDS, phrases such as “no information” or “no data” generally indicate that no toxicity studies have been conducted. The Pigment Quick Guide chart indicates “no data” where this is the case. Conservators are advised to exercise caution. Refer to the table of “Hazards of Metals and Metal Compounds” ([http://www.conservation-wiki.com/w/images/1/1c/H%26S\\_Hazards\\_of\\_Metals\\_and\\_Metal\\_Compounds\\_Table.pdf](http://www.conservation-wiki.com/w/images/1/1c/H%26S_Hazards_of_Metals_and_Metal_Compounds_Table.pdf)) for common health hazards associated with metals contained in the pigments.

### SUMMARY

Commercially-produced materials are always subject to change and research into some of these materials is ongoing. Use less toxic substitutes where possible and practice good hygiene. Always be sure to check the chemical composition of the material you are using and research any new updates.

The Health and Safety Committee thanks Monona Rossol for her suggestions and contributions to this article.

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## New Publications

Bergdoll, Barry, Jennifer Gray, et al. *Frank Lloyd Wright: Unpacking the archive*. New York: Museum of Modern Art, 2017. ISBN: 9781633450264. Published for a major exhibition at The Museum of Modern Art in New York (12 June-1 Oct 2017), this catalogue includes a chapter by Ellen Moody on the conservation of Wright's New York models. The title refers to the Frank Lloyd Wright Foundation Archives at Taliesin West, Arizona, which were recently acquired by MoMA and Avery Architectural & Fine Arts Library, Columbia