ACTS FACTS - ALL ABOUT WAX THE MONTHLY NEWSLETTER FROM ARTS, CRAFTS AND THEATER SAFETY (ACTS) / 181 THOMPSON ST.. K 23 / NEW YORK, NY 10012-2588 / PHONE 212/711-0062
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Artists encounter wax in many products including crayons, resists for batik and ceramic glazes, cosmetics, vehicles for oil paints and encaustic, modeling wax for lost wax jewelry and foundry casting, candles, polishes, anti more. There are three major sources for the many waxes used in these products.

- animal: beeswax, lanolin, shellac wax, Chinese insect wax, etc.
- vegetable: carnauba, candelilla, bayberry, sugar cane, etc.
- mineral:
    a) fossil or earth waxes--ozocerite, ceresin, montan.
    b) petroleum waxes--paraffin, microcrystalline, etc.

WAX HAZARDS

Handling solid wax products at room temperature is not dangerous. Wax only becomes hazardous when heated or burned. All waxes emit similar substances when heated because waxes actually are mixtures of similarly structured organic chemicals. And because they are mixtures, it also is difficult to predict the exact temperature at which they begin to decompose:

Decomposition occurs when heat breaks down large wax molecules into many smaller ones. Almost no decomposition takes place when wax is just warm enough to melt. As the temperature increases, decomposition accelerates creating more and more small molecules. Some of these are very toxic gases that are released into the air. They account for the typical "hot wax" odor we smell around wax pots or when batik resists are ironed. Among these gases are acrolein and aldehydes such as formaldehyde and acetaldehyde.

Acrolein and the aldehydes are irritants which can damage the respiratory tract. Artists chronically exposed to small amounts may develop more colds and respiratory infections than usual because their irritated sinuses and respiratory membranes are less able to resist invasion by infectious organisms. More serious problems such as bronchitis and chemical pneumonia may develop in people who are exposed to larger amounts of these chemicals.

Besides being an irritant, formaldehyde causes cancer in animals, probably causes cancer in humans, and is known to cause allergies in many people. Acrolein, acetaldehyde, and other aldehydes are not well-studied, but many experts suspect they cause effects similar to those caused by formaldehyde including cancer.

Wax molecules also vaporize and recondense above hot wax to form tiny airborne wax particles called "wax fume." These small fume particles can be inhaled deep into the lung's air sacs where the body finds it difficult to remove them. Wax fume is usually invisible, but when wax is greatly overheated, it appears as a fog hovering around the wax surface. This fog can explode or flash into fire if a spark or flame is present.

AIR QUALITY STANDARDS Some wax emissions are regulated in the workplace by the Occupational Safety and Health Administration (OSHA) and/or have workplace limits assigned to them by the American Conference of Governmental Industrial Hygienists (ACGIH). Some of these limits are in the table below.

Employers or administrators are required by law3 to train their workers (artists or teachers) about these OSHA and ACGIH standards and to provide protection such as ventilation sufficient to keep wax emissions below these limits. Establishing ventilation rates may require air testing. One such air study done recently in a tourist-oriented candlemaking shop showed that the limits for both paraffin fume and acrolein were exceeded.'

THRESHOLD LIMIT VALUES FOR POSSIBLE WAX EMISSIONS

Emission	Air-quality limits*
acetaldehyde	25 ppm TLV-CEILING
acrolein	0.1 ppm TLV/PEL-TWA
crotonaldehyde	2 ppm TLV-TWA
formaldehyde	0.75 ppm PEL-TWA
glutaraldehyde	0.2 ppm TLV/PEL-CEILING
paraffin fume/mist	2.0 mqlm' TLV/PEL-TWA

Threshold Limit Values (TLVa) are workplace air quality standards set by the American Conference of Oevermnental Industrial Hygienists. The amounts In the air are expressed In parts per million (ppm) or In milligrams per cubic motor (mg/m3). TLVs are designed to protect the majority of healthy adult workers from adverse effects.

There are three types:

1. =yy-Tiae Weighted averaaes, which are airborne concentrations averaged over the eight hour working day.
2. 11.V-Short Term Exposure Lisi{,&, which are 15 Inute average concentrations that should not be exceeded.
3. =LV-CeilinQ, which are concentrations that should not be exceeded even for an instant.

Similar limits called permissible exposure limits (PEI.s) are set by the Occupational safety and Health Administration (OSHA). Prudence dictates using which ever limit is the strictest. These limits are in this table."

RESPIRATORY PROTECTION

Air-purifying respirators are not recommended for wax emissions. In fact none are approved5 for acrolein because the concentration at which most people can smell acrolein is unhealthy. This means that respirator users risk overexposure because they would not be able to detect the odor if their cartridges wore out and acrolein began leaking though.

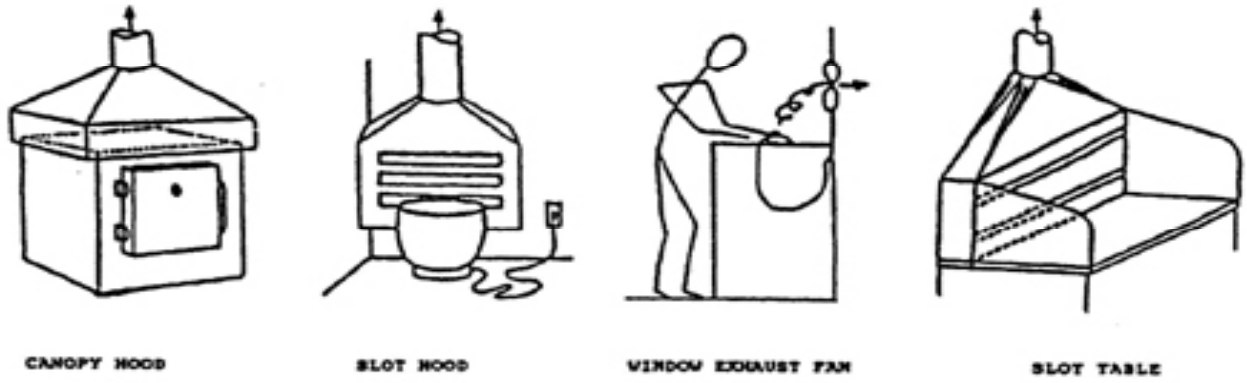
Another reason respirators are not recommended involves the number of cartridges that would be needed:

a formaldehyde cartridge for formaldehyde; a fume filter for paraffin fume; and an organic vapor cartridge for glutaraldehyde and other organics. And there are other emission many of which are not even known. Clearly, exhaust ventilation is needed to protect people from wax emissions.

VENTILATION

Local exhaust ventilation such as a canopy hood or a side draft slot hood should be used to capture emissions from burn-out kilns, hot wax pots, and similar operations. The ventilation system should exhaust to the outside. If the amounts of wax are large and the temperature of the wax is kept very hi the system also will need to be explosion-proof.

For ironing out batik or sculpting with a hot knife, a ble-level window exhaust fan may be suitable if local codes allow the use of this method. If not, a slot hood table will work.



WAX PRECAUTIONS

Ceramic artists can avoid wax emissions completely by using cold wax emulsions as resists. Batik artists can use vegetable matter resists, which can be washed out with soap and water. Some batik artists boil most of the wax out of the fabric (which keeps the 2° Fahrenheit) and then send the fabric to professional dry-cleaners for complete wax removal.

Projects such as c d making and melting crayons should not be used with children de six and under. Not only is the wax a hazard, but some pigments also emit toxic chemicals when heated. When the children are older, candles and crayons can be melted with proper ventilation. Be wary of taking children to candle making shops where strong perfumes are used to mask the odors unless the wax pots have local exhaust ventilation. paintings should not be smoothed over with` torches. Instead, hair dryers and other low temperature devices should be used. Sculpture and jewelers wax can be cut and tooled without heat. There are modeling waxes that can be shaped with the heat of hands. And if hot tools or heaters must be used, good local ventilation should be provided.

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1. There are other less commonly used waxes which will not be covered here. They Include:
   a) ethylenic polymers and polyol other-esters ("Carbowax," sorbitol, etc.)
   b) chlorinated naphthalenes (called "Halowaxes," they have many uses including as insect and flame proofing. They are toxic by Ingestion and skin contact.)
   c) Fiscber-Tropsch synthesis waxes: made by a process involving steam and coke not done in the U.S.
2. Carcinoqenicity of Acetaldehyde and Malonaldehyde, and Mutagenicity of Related Low-Molecular-Weight Aldehydes." KIOSK Current Intelligence Bulletin 55, September 1991.
3. The Hazard Communication Standard. 29 Code of Federal Regulations (CFR) 1019.1200.
4. Information given to the author by a municipal health department officer after consultation. The shop was one in which both employees and customers could dip candles. The perfume covered the acrolein odor.
5. The National Institute for occupational Safety and Health (XIOSH) sets standards for respiratory protection. KIOSK currently does not approve any air-purifying respirator for acrolein.

TLV BOOKLET AVAILABLE FROM ACGIH

For those artists and teachers who are still unfamiliar with the Threshold limit values (TLVs) mentioned in the article above, the latest American Conference of Governmental Industrial Hygienist's (ACGIH) fast reference booklet of TLVs is now available.

TLVs are recommended maximum exposure levels for airborne chemicals and other hazardous substances in the workplace. All employees who use chemical products, including teachers, professional artists, and theater workers should be acquainted with TLVs through their OSHA-mandated hazard communication training. Many trained workers use the ACGIH's 132 page booklet which lists TLVs and guidelines for physical agents such as radiation, lasers, and noise. The booklet is now available for $10.00 a copy from ACGIH, 6500 Glenway Ave., Bldg D-7, Cincinnati OH 45211; 513/661-7881, fax 513/661-7195

ACTS FACTS' SOURCES Include the Federal Register (FR), a compilation of all the regulations and public notices Issued by all federal agencies. the bureau of National Affairs occupational Safety & Health Reporter (IR11OsRR), the Mortality and Morbidity Weekly Report (Mlw1t), and many health, art, and theater publications.

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