TOKOBO
pottery

HEALTH AND SAFETY IN CERAMICS

Dust

Dusts are a major hazard in the workshop. Some dusts are toxic, most are non-toxic but nearly all forms of dust in the ceramics workshop are hazardous. Very few types of dust in the studio are likely to cause an immediate reaction in the body. However, many of them are not able to be expelled by the body - such dust particles accumulate in the lungs over the years. If measures are not taken to control the level of exposure to dust it can lead to diseases later in life.

Clay dust
All clay dust is hazardous to some degree. However, the more 'free silica' (that is silica in a pure form such as quartz or flint) a clay body contains the worse it is. Clay that is damp, in the form of a slip or plastic clay, does not create dust until it is allowed to dry.
Dangerous levels of dust are not necessarily visible. Dust particles below the size of 10 microns (one-hundredth of a millimeter) -which are suspended in air are smaller than can be seen in a room gilled with strong sunlight - are the most damaging. These smaller particles easily become airborne and remain so for several hours, they are readily inhaled deep into the lungs where they mostly tend to stay (especially in smokers).

- Make good use of good quality dust masks
- Overalls are not just for keeping your clothes looking nice, they significantly reduce the possibility of spreading harmful materials out of the workshop and even home with you
- Clay must be kept well sealed.
- Regular wet cleaning
- Never dry sweep.
- If you do somehow cause dust to become disturbed, use a water sprayer to help it settle.

Glazes and Glaze Materials
All glaze materials should be treated with respect.
Most ceramics materials incorporate either silica - whose fine dust can cause silicosis : or silicates (more complex compounds which involve silicon and oxygen) -the dust of which can lead to diseases similar to silicosis, such as talcosis or kalinosis. In addition alumina dust should be acknowledged as a hazard which with excessive, prolonged exposure can lead to another similar disease called aluminosis.

Pulmonary Diseases
Diseases affecting the lungs are known as Pulmonary Diseases. Few of them associated with ceramics materials are fatal in themselves, however they can cause disabilities such as fibrosis of the lung tissue (the tissue becomes tough and fibrous - it loses the elasticity required of breathing), limited lung capacity accompanied by shortness of breath, bronchial conditions and low physical energy levels. Furthermore, they increase the body's susceptibility to more serious diseases such as:
emphysema - dilated air cells in the lungs
tuberculosis - small swellings in the lung tissues

pneumonia - inflammation of the lung

Toxic materials

Although some materials are well researched and have been confirmed as being highly toxic, the facts about many glaze and clay constituents with regards to their hazard-levels are less clear. For this reason it is wise to take sensible precautions with all materials - It will be noted, that, due to EEC requirements, suppliers of ceramic materials are making most (if not all) raw materials as 'Harmful' - this is unhelpful in discussing which materials are most harmful from those that are only mildly so, but it does serve to remind us that we need to adopt good habits in handling all clay and glaze materials.

The More Toxic Materials
Substances used in ceramics that are considered highly toxic include compounds of:

- lead
- barium
- arsenic
- antimony
- vanadium
- beryllium
- chromium
- cadmium & selenium
- manganese
- soluble salts such as suppurates, nitrates and chlorides of copper, cobalt, manganese, iron and chrome. These are very rarely used.

Of course, in the history of pottery toxicity, lead is probably the most well-known. The body stores any lead that is ingested or inhaled. Years of exposure to even moderate levels of lead can allow it to accumulate in the body, where it can reach harmful levels. Many symptoms are suffered, the most serious of which is brain damage which can be severe enough to cause death. Milder cases of cumulative lead poisoning can be remedied but recovery may take years.

Other toxins to be wary of include:

- boric acid and borax
- lithium carbonate
- potash (potassium carbonate)
- soda ash (sodium carbonate)
- zinc oxide
- iron chromate

Some of the toxic materials mentioned will not be found in raw states in the glaze room but they can be constituents of manufactured underglazes, body/slip stains, glaze stains or onglaze enamel/lustres. Hacks said that, however, ceramic stains are very chemically stable by nature. Nevertheless, it is wisest to treat all these sources of color as potentially toxic to the ceramics. It is also important to read the information provided by the supplier regarding the health and safety issues applicable to any particular source of manufactured color.
Exposure to highly toxic ceramic materials should be minimized. Regular periods without exposure allow the body time to expel any excess.

Hand that do pottery tend to get dried and cracked, allowing toxic materials to enter the body more easily - Use hand creams; use rubber gloves when handling glazes and glaze materials - especially when using vanadium pentoxide, chromium compounds or soluble salts.
If you have any cuts, wear waterproof plasters whilst in the workshop. When you have finished, remove the plaster(s) and wash your hands.
Toxins are most likely absorbed through the breathing in of the dust in the glaze room. Therefore, as with non-toxic dust, the best measures to take are:

- always wear dust-masks in the glaze room, ventilate well, keep the glaze room rigorously clean, and always wet-clean.
- always wear overalls in the glaze room. Clean your overalls frequently. Furthermore, keep scoops clean and do not cross-contaminate glaze materials - this can, not only possibly ruin someone's work, but it could introduce dangerous solubles into what is believed to be a food-safe glaze recipe.

Eye protection
If Any materials in the workshop get into the eyes, wash them thoroughly with cold or lukewarm water.

Solubility
The degree of hazard associated with any toxic substance has to do, not only with what substance it is, but also with how soluble a form it is in. The greater the solubility of a substance the more easy it is for the body to absorb. many clay and glaze materials are available in forms of greater or lesser solubility. For example, raw oxide of lead used to be widely used for making lead glazes but lead poisoning was common in the industry. Life expectancy in the English potteries of the late nineteenth century was only around forty years. 'Frits' were introduced to tackle this problem. Frits involve the combining of lead oxide with silica and stabilizing materials, and melting then rapidly cooling them to creat a glass which is then ground to a powder to be used as a glaze ingredient. There are several different lead frits available; the solubility of each is decided, largely, by how much silica the lead oxide is combined with, therefore, the order of increasing solubility is:

- lead bisilicate
- lead sesquisilicate
- lead monosilicate

It should be noted, however, that even in highly insoluble forms toxic substances remain relatively toxic and all precautions should always be taken when handling such materials.

The Health and Safety of the consumer

The use of insoluble materials does not necessarily produce an insoluble fired glaze. Fired wares can release soluble metal oxide when in contact with foodstuffs; some of these oxide can be toxic to the consumer; these include aria, some of the coloring oxides and , most importantly, lead oxide. Incidentally, no combination of copper and lead should be considered food-safe. Even if lead oxide is introduced to a glaze in a form of relatively insoluble fit, the slightest addition of copper will render the finished glaze unsafe to use on tableware.
Only lead release and cadmium release are covered by law in the UK. Ceramists making domestic wares with a lead or cadmium glaze applied are required to have a sample of their products tested for metal release before they can be marketed. The best measure of all, however, is to try and avoid altogether the use of potentially toxic glazes on vessels for food use or at least in the areas where they come into contact with food or the mouth of the user.

Workshop practice: do's and don't

Eating and drinking in the workshop
No food or drink should be taken into the workshop.

Smoking
Smoking greatly increases risks. Smokers are much more susceptible to the health hazards associated with ceramics, even if they refrain from smoking in the studio. The effects of smoking interact with the effects of harmful ceramics materials. Non-toxic particles are more likely to enter the lungs and to remain trapped there. The likelihood of the body absorbing toxins greatly increases and they are likely to remain longer in the system, the toxic effects are vastly increased, and the body's defenses against them are weakened.

Ventilation
Kiln fumes (particularly from gas kilns and especially during reduction firing) are potentially life-threatening - carbon monoxide being the main offender. This gas, taken into the lungs, very readily takes up the slots in the bloods hemoglobin normally reserved for oxygen, thereby interfering with the respiratory process and depriving the body of necessary oxygen. In every firing, whatever kiln type is used and particularly during the glaze firings, toxic fumes of various types are always given off, including sometimes sulphide, chlorides and fluorides and volatile metals (found in lustrous and angle enamels).

Salt-glazing and Raku firing can create toxic fumes. In the case o salt-glazing chlorine gas is released and if this gas is inhaled it can lead to the formation of the corrosive hydrochloric acid. However, provided common-sense precautions are taken, the risks are low.

Vapors from prepared lustrous and media associated with on glaze enamels are regarded as irritants and they are also usually flammable. Again cenilation and limited exposure time are the measure to take. Flammables should always be stored in air-tight containers and kept away from sources of high temperature including direct sunlight (as should any cloths, sponges and brushes contaminated with them). This will help to avoid spontaneous combustion.

Kilns

There are obvious hazards to do with high temperatures, gas, and electricity in the kiln room. One should also be aware of the less obvious ones.

Eye Damage
Between 'red heat' (around 600) and 'white heat' (around 1300) use Welders' goggles (or those found in ceramics or glass materials suppliers) to look in a kiln (not sunglasses - they will not protect the eye from the eye from the harmful infra-red light in the kiln)
Burns
Never attempt to unpack a hot kiln with anything other than proper kiln gloves. Some things, such as a towel or overalls or a piece of cloth can seem efficient at first but fail to protect the hands at some point between the kiln and the destination. It should be noted that, when unpacking a still hot kiln, both the pots and the kiln furniture are always significantly hotter than the reading given by the pyrometer or controller (which closer resembles the temperature of the kiln atmosphere). Allowances should be made for this when opening or unpacking a kiln.
Cuts

Pots straight from the kiln after glaze firing sometimes have sharp broken edges of glaze on them - especially where a stilt has been removed. Glazes being more or less glasses, these edges can be razor sharp and sometimes cause nasty lacerations. This hazard can be avoided by handling the ware carefully; and by immediately riding the offending edges away with an abrasive block (wearing a mask) and not leaving dangerous pots lying around for someone else to cut themselves on.

Dust

Any dust found in the kiln area is likely to be of the worst kind and should be treated with special care.

Machinery

Keep loose clothing and long hair away from moving parts and high temperatures. Never be tempted to use kilns or machinery that you have not been shown how to use.

When using machinery that spreads debris (such as the lathe or a guiding machine) wear clear protective goggles.

Potter's back

Weights are often lifted in ceramics - large pieces of work, bags of clay, big kiln shelves - consequently, back problems are very common.

The precautions to take are: use proper lifting methods (bend at the knees keeping your back straight and keep the weight as close to your body as possible); and exercise the back muscles and the abdominal muscles. Also, if working for long periods in one position (e.g. when throwing at the wheel or turning on the lathe) be aware of keeping good posture and take regular breaks.

General good workshop practice in a nut-shell

- Develop working methods that minimize the production of both toxic and non-toxic dusts.
- Make full use of appropriate protective gear.
- Clean up all areas regularly.
- Always wet-clean.
- Always clean up spillages immediately and thoroughly (even if they have been left by someone else). Spillages can cause accidents but also if they are allowed to dry they can contribute greatly to dust levels.
- Make good use of ventilation facilities.
- never run in the workshop.
- Observe all department procedures regarding kins and general equipment and machinery.
- Do not eat, drink or smoke in the workshop.

Summery

Ceramic involves a wider range of health hazards than most areas of design, art or craft; however, if the basic principles are followed and if simple measures are obeyed the maker (and the consumer) are under little or no risk.