HAZARDOUS SUBSTANCES

PLASTICS

The term "Plastic" covers a wide range of synthetic polymer materials. What they have in common is that they are all made by joining together or "polymerizing" a bunch of molecules (monomers). For example, polystyrene is a polymer of styrene, polyvinyl chloride (PVC) is a polymer of vinyl chloride and ABS is a co-polymere of acrylonitrile, butadiene and styrene. Chemical companies usually sell plastics to product and parts manufacturers in an unfinished form known as "resin", in the form of solid granules, pellets, powder and sometimes as liquids. The resins are moulded, pressed or extruded into their final form because they are directly exposed to higher concentrations of monomers and additives. Workers in chemical plants who make the plastic monomers and polymerize them to make resins face hazards that are somewhat different from those faced by those who form the final plastic products from resin. Nevertheless, your health may be affected by the polymer resin itself, by monomer residues remaining in the resin, by chemicals added to the plastic to make it more flexible, stable or flame retardant, or by colouring agents. These substances may also be released to the air when the plastics are heated.

Health Hazards from Plastics Processing

When plastics are heated to form final products, monomers, additives and degradation products can be released. Small amounts of these may also be present in the resins before heating. They can affect the health of workers who use, clean or maintain the processing equipment. The table on the following page shows what these substances are and what types of effects they can have on your health.

POTENTIAL HEALTH HAZARDS OF PLASTICS PROCESSING

Polymer Type	Degradation Products and Residues	Health Hazards
ABS	Acrylonitrile, butadiene. Styrene Cyanide Nitrogen oxides	irritants and suspected carcinogens toxic respiratory system irritants
Acrylics	Methyl methacrylate Cyanide Nitrogen oxides	skin sensitizer and respiratory irritant toxic respiratory system
Amino resins (e.g. urea-formaldehyde)	Formaldehyde	irritant, toxic, probable carcinogen
Epoxy resins	Bisphenol-A, hardeners epichlorohydrin	irritants and sensitizers
Fluoropolymers (e.g. Viton, Teflon)	Carbonyl Fluoride Perfluoroisobutylene Hydrofluoric acid	irritant irritant severe irritant, burns skin
Phenotics (e.g. Bakelite)	Aldehydes, ammonia Cyanide Nitrogen oxides Formaldehyde	irritants toxic respiratory system irritants irritant, toxic, probable carcinogen
Polyamides (e.g. Nylon)	Cyanide Ammonia, nitrogen oxides	toxic irritants
Polyethylene, polypropylene and Polyesters	Carbon monoxide Acrolein, Aldehydes, acids	toxic irritants
Polyoxymethylene acetal resin (Delrin)	Formaldehyde	irritant, toxic, probable carcinogen
Polystyrene	Styrene Benzene Toluene, acrolein	toxic, possible carcinogen proven carcinogen irritants
Polyurethanes	Aldehydes, ammonia Cyanide Isocyanates Nitrogen oxides	irritants toxic irritants respiratory system irritants
Polyvinyl chloride (PVC)	Vinyl chloride Hydrochloric acid, phosgene Dioxins & furans (if burned) Phthalic acid esters Organotin compounds	toxic and proven carcinogen irritants carcinogenic teratogenic (birth defects) highly toxic, irritants
Unsaturated polyesters	Styrene	Irritant and possible carcinogen

Prevention

Enclose process
Local exhaust ventilation
Personal protection where appropriate, depending on type of resin used.

Some resins release carcinogenic degradation products. All carcinogens should be eliminated from the workplace wherever possible as even minimal amounts can initiate the uncontrollable growth of abnormal cells.

Standards

ACGIH TLVs for monomers, additives and degradation products:
Acrolein 0.23 mg/m3 (0.1 ppm)
Acrylonitrile 4.3 mg/m3 (2 ppm)
Benzene 32 mg/m3 (10 ppm), to be changed to 0.96 mg/m3 (0.3 ppm)
Butadiene 4.4 mg/m3 (2 ppm)
Carbon monoxide 29 mg/m3 (25 ppm)
Carbonyl fluoride 5.4 mg/m3 (2 ppm)
Di-(2-ethylhexyl)phthalate 5 mg/m3
Epichlorohydrin 7.6 mg/m3 (2 ppm), to be changed to 1.0 mg/m3 (0.5 ppm)
Formaldehyde 0.37 mg/m3 (0.3 ppm), U.S. NIOSH recommendation (0.016 ppm) (Ceiling)
Methyl methacrylate 410 mg/m3 (100ppm)
Styrene 213 mg/m3 (50 ppm), to be changed to 85 mg/m3 (20 ppm)
Toluene 188 mg/m3 (50 ppm)
Vinyl chloride 13 mg/m3 (5 ppm)

lh:cope343
August 2011