

## OHS INFORMATION SHEET 28: USE OF CARBON FIBRE COMPOSITES

February 2009

*This information sheet provides advice for developing, implementing and maintaining safe work practices for staff, students, contractors and visitors working or studying at Monash University who handle carbon fibre.*

### 1. WHAT IS CARBON FIBRE?

Carbon fibre is a material consisting of extremely thin fibres about 5-10 micron in diameter, which are composed of carbon atoms and are considered especially strong for their size. Several thousand carbon fibres are twisted together to form yarn, which can then be used in the raw form or woven into a fabric. When combined with a resin and wound or molded to form composite materials, a high strength to weight ratio is achieved.

### 2. HEALTH EFFECTS OF CARBON FIBRE EXPOSURE

The principal health hazards of carbon fibre handling are due to mechanical irritation and abrasion similar to that of glass fibres. Carbon fibres are easily broken by stretching (by less than 2% elongation); the fibres can easily become a fine dust during cutting, machining or mechanical finishing and can then be released into the surrounding atmosphere. These micro fibres if uncontrolled have a potential to stick into human skin or the mucous membranes causing irritation.

### 3. HEALTH EFFECTS OF SOLVENTS USED IN CARBON FIBRE MANUFACTURE

Most fibres have a coating (called a "sizing" which is often an epoxy or other resin) that can also cause chemical irritation. Many of the solvents used in advanced composite processes are volatile, flammable and irritating to skin and eyes. Health effects typical of these chemicals include irritation of the eyes and upper respiratory tract, dizziness, drowsiness, nausea, and vomiting. Visual disturbances may also occur. Repeated or prolonged skin contact with these liquids may cause dermatitis. Material Safety Data Sheets (MSDS) must be consulted before the use of the particular solvents and or resins with the carbon fibre product and all precautions outlined in the MSDS should be implemented. Further information is available in [Using Chemicals at Monash University](#)

### 4. RISK MANAGEMENT

After curing, fibres become very rigid and may protrude from poorly machined or fractured surfaces. Such surfaces should be handled with care, due to the potential for laceration and impregnation of fibre splinters into the skin. Heavy style gloves should always be worn when handling materials to protect against penetration of these fibres as well as contact with resins

Protection of eyes and throat from carbon fibre dust is paramount. Users must wear full goggles and a dust mask to prevent dust inhalation. Dust particulate masks must be fit tested to the individual. Protective clothing should be worn whenever dust is created (such as while machining). The use of elastic cuffs on the protective clothing will keep dust from getting inside protective suits.

Carbon fibres are electrically conductive and dust or waste can cause short-circuits within electrical equipment. Specific vacuum cleaners (designed specifically for extraction of conductive substances) should be used in conjunction with a suitable HEPA filter.

Each department/school/centre is responsible for completing a risk assessment of any task involving work with Carbon Fibres' using the [Monash University Risk Control Program](#). Where there are questions about the potential for exposure, contact Occupational Health and Safety for assistance.

### 5. ELECTRICAL SAFETY

Due to the conductivity of the carbon fibres, sealed or air purged electrical equipment must be used when processing or machining. If airborne carbon fibre dust or off-cuts penetrate into electrical switches or equipment, short circuits or electric shock may occur. Surrounding equipment must be fully insulated at connection points, exposed wires or cables must be covered by an appropriate insulation. Carbon fibre off cuts or debris lodging into a plug may cause electric shock or short-circuits at electric outlets when the plug is inserted. Thorough inspection of appliances before plugging in, the use of dust proof outlets in the areas designated for fibre processing as well as protective gloves will reduce the risk of this occurrence. If wet processing carbon fibre or composite materials takes place only air driven or intrinsically safe equipment for wet processing is to be used.

## 6. SAFE WORK PRACTICES

Staff and students using carbon fibres or composites must be trained in its use.

- Tasks involving dry machining of carbon fibre must be undertaken using an appropriate extraction or ventilation system.
- Tasks involving the use of solvents and resins must be done in conjunction with MSDS requirements. This includes using in a well ventilated areas, a fume cupboard or spray booth.
- When machining of carbon fibre, minimise dust or particulate generation by:
  - Wet processing of the material – see [electrical safety](#)
  - Using non-powered hand tools
  - Cutting the material while still “green” or partially cured
- Emergency eyewash stations and hand washing facilities must be available for each work area.
- A first aid kit must be available for each work area.
- All skin and eye contact must be avoided.
- Student and staff exposure may also be controlled by scheduling operations with the highest exposure risk at a time when the fewer people are present however within normal business hours.

## 7. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Gloves, protective clothing, and eye protection is mandatory due to the nature of working with composite materials. Selection of appropriate protective equipment should be based on the type of task being undertaken and the associated hazards.

**Protective clothing** should cover of the entire body to avoid exposure to carbon fibres or resins and solvents. e.g. Tyvek Suit

**Eye protection** can be provided by standard safety glasses with side shields for non machining work. Goggles, or a combination of a face shield and glasses is required for machine based work.

**Gloves:** regular latex or nitrile disposable gloves can be used with carbon fibre materials. Heavier gloves are more appropriate when fibre splinters are a concern. When using solvents or resins the material safety data sheet should be referred to for the appropriate glove type. See <http://www.ansell.com.au/specware/> for glove selection

**Respiratory protection** is required where:

- Airborne solvent or dust may be present or “off-gassing” is occurring.

### Contamination of PPE and clothing

Following any contamination of clothing with carbon fibre or resin solutions, remove the garments and dispose of as waste (see below). PPE may be washed under running water; disposable gloves are to be discarded after contamination.

## 8. WASTE DISPOSAL

Cured or raw carbon fibre waste should be regarded as “Industrial Waste” double bagged and disposed of through the regular waste stream. Fine waste such as dust and loose fibres may be disposed of in a similar way however care needs to be taken in collection and PPE must be worn. Chemical waste must be disposed of as prescribed waste through a licensed contractor such as Chemsal

## 9. FIRST AID

**Skin:** Irritation and rashes - Wash under cold or warm water with soap or use sticky tape to help remove the fibres from the skin.

**Eye:** After removing contact lenses if any, wash eyes with clean running water for approx than 15 minutes. Remove contact lenses if worn before washing. Seek medical assistance

**Ingestion:** Wash out mouth immediately with clean fresh water. Seek medical assistance

**Inhalation:** Dusts and fine fibres are documented as being respirable, and embed into mucous membranes causing irritation. Remove person to fresh air and seek medical assistance

## 10. SPILLS

Spills of solvent materials or resins must be cleaned up immediately using local or building spill kit to MSDS directions.

For further information contact your local OHS&E Consultant or Occupational Health and Safety by phone on 990 51016 or by email on [ohsehelpline@adm.monash.edu.au](mailto:ohsehelpline@adm.monash.edu.au).