Department of Engineering – Risk Assessment

Ref No. B950

Title of project/experiment/activity **Composite manufacture**	
Location of activity Cambridge Graphene Centre : Chemistry Lab	**Start and end dates** 24/08/2015 - continuous

Brief description (or attach procedure/protocol)

**Nanomaterial:

The nanomaterial can be in a powder form (see COSHH form) or liquid ink containing the nanomaterial dispersed in a solvent (see COSHH form).

When using inks, the concentration of the ink is measured (see relevant risk assessment) and the volume needed is poured into a container under the solvent fume cupboard and the container is kept sealed. The ink can subsequently be freeze-dried (see relevant risk assessment) to obtain a powder of nanomaterial.

When using powder nanomaterial, the desired quantity of nanomaterial is weighted inside the glovebox (see relevant risk assessment) in a container and the container is sealed before taking it out of the glovebox. The powder can subsequently be dispersed in a solvent (see relevant COSHH) under the solvent fume cupboard and sonicated by bath sonication inside the sealed container (see relevant risk assessment).

**Polymer matrix:

The polymer matrix (see relevant COSSH form) can be solid or liquid. For the nanomaterial to be mixed with the polymer matrix, the polymer has to be in a liquid state, either molten or dissolved.

**Composite preparation:

The solid polymer can be melt in a glass beaker on a hotplate inside the solvent fume cupboard in which the nanomaterial powder was previously weighted. The molten polymer and nanomaterials are stirred together until creation of a homogeneous composite. The composite is then cooled down to obtain the solid composite.

The solid polymer can be dissolved by mixing the polymer with the appropriate solvent inside the fume cupboard (see COSHH form) using a sealed container and the speed mixer (see relevant risk assessment). The liquid polymer is then added/mixed to the nanomaterial powder or the ink container inside the fume cupboard. The solvent can subsequently be evaporated by placing the open container inside the fume cupboard to create a solid composite.

The solid polymer can be mixed with nanomaterial ink (if the solvent of the ink dissolves the polymer) inside the fume cupboard (see appropriate COSHH form) using a sealed container and the speed mixer (see relevant risk assessment). The solvent can subsequently be evaporated by placing the open container inside the fume cupboard to create a solid composite.

The liquid polymer can be mixed with the nanomaterial powder or the ink inside the fume cupboard to create a liquid composite.

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Hazard	Effect	Control measures	Residual risk
General hazards in lab	Inhalation of solvents Exposure to chemicals harmful to health	Other lab users will be using solvents with appropriate extraction in place. (Likelihood: 1, Severity: 1) Gloves, eye protection and lab coat must be worn whilst in the laboratory. The Chemistry Lab rules will be respected.	Low risk
Heat	Possible burning	The user has to be careful when handling melted polymer. The user must avoid touch any hot part of the beaker or the hot polymer. (Likelihood: 1, Severity: 1)	Low risk

Personal Protective Equipment required [*eye/face protection, respiratory protection, gloves, lab coat etc*]

Lab coat, gloves (purple nitrile) and eye protection (safety specs) required in the lab at all times

Emergency Instructions & First Aid

Spillage:
Speed mixing containers should be handled only in the solvent fume cupboard. Solvent spillage or water-based dispersion spillage should not be more than 50 mL, and can be dealt by wiping with cleanroom wipes. The wipes disposed into waste bins or should be left to dry (in the case of solvent spillage) prior to disposal into waste bins.

Fire:
In case of fire, the fire alarm should be sounded and fire service called. If safe to do so, the fire may be extinguished using an extinguisher containing carbon dioxide, located outside the laboratory in the corridor.

First aid:
General advice: Consult a physician. Show this safety data sheet to the doctor in attendance.
If inhaled: If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
In case of skin contact: Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.
In case of eye contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

Any special monitoring required [*e.g. hearing test, vibration monitoring, health surveillance*]

No

Further control measures required? If yes, list with actions.

Waste Disposal Procedures: Aqueous waste should be disposed in a container separate from solvent waste. Solvents will be disposed of in suitable chlorinated (e.g. DCB, chloroform), or non-chlorinated (all others) waste

containers.
Biological/Laser/Radiation Approval [*requires relevant Specialist Safety Officer signature and date*] N/A
Out of hours/Lone working N/A

Signature to confirm that this is a suitable and sufficient assessment of risk and that stated control measures are in place. This risk assessment should be reviewed if additional risks not covered in this assessment are identified or if there is any reason to indicate that the control measures are insufficient.

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Local Safety Coordinator	**Signature** David Hardie	**Date** 13/4/17
Departmental Safety Office IAN SLACK	**Signature**	**Date** 24 APR 2017