Department of Engineering – Risk Assessment

Ref No. 8953

Title of project/experiment/activity

Freeze drying to produce aerogel and fluffy powder

Location of activity	**Start and end dates**
Cambridge Graphene Centre : Chemistry Lab	2015/11-continuous

Brief description (or attach procedure/protocol)

Freeze drying is a process to use sublimation to extract water (ice) and keep the pores, to get aerogel and fluffy powders.

The operation processes are listed as follows:

1. Freezing the aqueous sample in low-temperature refrigerator or in liquid nitrogen; for instance, GO solution and graphene nanoplatelet inks. (Do not use other organic solvents. They will be ventilated into the lab finally and could be toxic. Additionally, the organic solvents could erode the machine, especially the PMMA top part);
2. Pre-cooling the machine;
3. Place sample into the bracket and start pump to form evacuation;
4. After drying, open the valve to let air inflate the system very slowly;
5. Fetch the sample after the pressure balance.

Hazard	Effect	Control measures	Residual risk
Liquid Nitrogen	Can cause rapid suffocation. Can cause severe frostbite.	1. Never allow any unprotected part of the body to touch un-insulated pipes or vessels that contain cryogenic fluids. 2. Put on loose fitting thermal insulated or leather gloves 3. Wear long sleeve shirts and trousers, and close shoes. Do not exposure skin when handling liquid nitrogen	Low risk
Taking out samples	Can form fluffy dust in the air	1. open the valve to let air inflate the system very slowly; 2. Wear gloves and mask	Low risk

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

Thermal insulating Gloves, Mask, Glasses.

Emergency Instructions & First Aid

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

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Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician. In case of eye contact Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. If swallowed Never give anything by mouth to an unconscious person. Rinse mouth with water. 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. No
Biological/Laser/Radiation Approval [*requires relevant Specialist Safety Officer signature and date*] N/A
Out of hours/Lone working Out of hours/lone working permitted if authorised by Supervisor. Requires HofD permission

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.

Name of Assessor Dr. Stephen Hodge Email: sah211@cam.ac.uk	**Signature**	**Date** 31/8/16
Name of Supervisor Prof A.C. Ferrari Email: acf26@cam.ac.uk	**Signature**	**Date** 2/9/16

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