Department of Engineering – Risk Assessment Ref No. BGSI

Title of project/experiment/activity Use of Ball Mill	
Location of activity Cambridge Graphene Centre : Chemistry Lab	**Start and end dates** 29/10/2015 - continuous

Brief description (or attach procedure/protocol)

In a ball mill, a cylinder containing stainless steel balls and the material to be ground is rotated on a platform and also rotated about its own axis in the opposite direction. This results in superimposed rotational movements producing frictional and impact forces, grinding material and reducing particle size.

The ball mill is located in Cambridge Graphene Centre Chemistry Lab and is used to exfoliate layered carbon and non-carbon nanomaterials from bulk materials. Refer to nanomaterial COSHH forms.

The Retsch PM100 is a commercially made system for ball milling and will be used in accordance with the manufacturer's instructions.

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
Unsecured grinding bowl	Injury to nearby lab users, damage to equipment	Never allow threaded spindle to lie loose in the grinding bowl fixture. Ensure red sleeve has latched in properly after clamping lid on bowl. (Likelihood: 1, Severity: 1)	Low risk
Electric shock	Shock to user, damage to equipment	Do not get outer parts of ball mill wet Do not clean with flowing water (Likelihood: 1, Severity: 1)	Low risk
Heating up of - grinding bowl	Possible burns to user, damage to equipment	Allow at least 10 minutes for grinding bowl to cool before touching it after the procedure has finished Set machine to run in intervals of no more than 60 minutes with 10 minute pause times to prevent heat build up (Likelihood: 1, Severity: 1)	Low risk
Pressure build up in bowl	Injury to nearby lab users, damage to equipment	Pressure in grinding bowl must not exceed 5 bar. Check pressure with a gas regulator before starting. Outlet valve is a Schrader type valve and can be connected to a bicycle pump with gauge. If material is being used that will expand (e.g. dry ice) ensure the final pressure inside will not exceed this limit. (Likelihood: 1, Severity: 2)	Low risk

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Unbalanced grinding bowl	Injury to nearby lab users, damage to equipment	Weigh grinding bowl before starting procedure and set the counter weight to match the bowl weight (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:
Grinding bowl should only be opened in "Isopro Nano" glove box as particulate matter may plume out of bowl.

Fire:
As the surface area of the sample will have increased the bowl may now contain pyrophoric material.
Slowly remove lid of bowl and wait for sparking to subside before disturbing material further.
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 in the corridor outside the laboratory.

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: Liquid dispersed milled nanomaterial should be disposed of in the appropriate aqueous, non-chlorinated or chlorinated waste containers. If milled material is being disposed of as powder it should be placed in a dedicated waste container in the IsoPro nano glove box and sealed to prevent dispersal of particulate matter in the air.

In the case of equipment malfunction/failure: press stop button on instrument if safe to do so, immediately shutdown instrument from power switch on rear, or switch off directly from plug socket.

Biological/Laser/Radiation Approval [*requires relevant Specialist Safety Officer signature and date*]
N/A

Out of hours/Lone working
The system can be used overnight. Requires HoD permission

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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 Mr. Jeffrey Mc Hugh Email: jm2080@cam.ac.uk	**Signature**	**Date** 08/08/16
Name of Supervisor Prof A.C. Ferrari Email: acf26@cam.ac.uk	**Signature**	**Date** 2/9/16

Local Safety Coordinator	**Signature** David Hardie	**Date** 13/4/16
Departmental Safety Office IAN SLACK	**Signature**	**Date** 24 APR 2017