Department of Engineering – Risk Assessment

Ref No. B886

Title of project/experiment/activity
Use of TA Q20 Differential Scanning Calorimeter (DSC)

Location of activity	**Start and end dates**
Cambridge Graphene Centre, Ground floor: Energy Storage Lab	01/08/2016 - continuous

Brief description (or attach procedure/protocol)

The Q20 DSC is a general-purpose calorimeter. The DSC determines the temperature and heat flow associated with material transitions as a function of time and temperature. It also provides quantitative and qualitative data on endothermic (heat absorption) and exothermic (heat evolution) processes of materials during physical transitions that are caused by phase changes, melting, oxidation, and other heat-related changes. The DSC instrument works in conjunction with a controller and associated software to make up a thermal analysis system. and must be used inaccordance with the manufacturers instructions,

Purge gases are accurately and precisely metered by digital mass flow controllers, and preheated prior to introduction to the sample chamber.

Various samples can be measured e.g. graphene, 2d materials, metal oxides, etc. (user should refer to personal risk assessments for sample handling).

Due to the variety of materials measured in the DSC, separate risk assessments must be carried out for every material measured in the instrument with consideration of sample form and size, aerosol/particle handling, material handling, toxicity, sensitivity, carcinogenicity, temperature, gaseous and non-gaseous products, etc. This list is only an indicator and not an exhaustive list of factors that need to be assessed.

This risk assessment does not substitute for a training from a qualified personnel nor is the training a substitute for this risk assessment.

Hazard	**Effect**	**Control measures**	**Residual risk**
General hazards in lab	Inhalation of solvents	Wash bottles containing volatile and combustible solvents, such as acetone, ethanol, and isopropanol, are present and used in the lab to clean items or equipment. (Likelihood: 1, Severity: 1) There is appropriate ventilation in place. The solvent will be contained in a wash bottle. Eye protection and lab coat will be worn while in the laboratory. The Energy Storage Lab rules will be followed.	Low risk
Electrical hazard	Electric shock	High voltages are present inside this instrument. Death can result from normal voltage of 240 V causing currents of greater than 30 mA to flow through the body for more than 40 ms. Minor shocks may also cause injury following involuntary muscle contraction. (Likelihood: 1, Severity: 3).	Low risk

		As a result, the instrument will not be opened by the user. Only a qualified technician or expert is allowed to open the instrument enclosure. The instrument must be unpugged before doing any maintenance or repair work that requires opening the cabinet covers.	
Chemical hazard	Fire; Inhalation of potentially toxic gases;	The sample atmosphere can be controlled during DSC experiments by connecting purge gases to the system. High purity N_2 (chemical purity grade) is connected as purge gas for the instrument and used during experiments. No other gases, except Ar can be used for purging. (Likelihood: 1, Severity: 1). A separate risk assessment must be done for every material measured in the instrument. If measuring samples that may emit harmful gases, the gases must be vented through an exhaust.	Low risk
Compressed gases	Explosion; Asphyxiation;	A compressed N_2 lab gas supply is used for the DSC. If the regulator fails, the gas is released suddenly with possible fatal consequences, but fortunately failures of regulators that have been purchased to the correct standard, and selected correctly for the service are rare. (Likelihood: 1, Severity: 3) Installing and replacing gas cylinders will be done by trained personnel. Compressed gas poses asphyxiation hazard – a condition of severely deficient supply of oxygen to the body that arises from abnormal breathing – such as choking. This could be fatal. (Likelihood: 1, Severity: 3) Proper ventilation is maintained to prevent injury or death due to asphyxiation in case of leaks. An oxygen level monitor is placed next to the BET system and will alarm if the oxygen level falls below 20% (Likelihood: 1, Severity: 3) The maximum pressure for gas delivery from the regulator for lab gas supplies is restricted to 5 bar and it will be typically set to 1.5 bar at the regulator. The purge rate in the instrument will be 50 mL per minute for your experiments.	Low risk

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Thermal hazard	Skin burn; Fire	During a sample run, the furnace base can be hot enough to burn skin. After experiment, the sample/sample holder may be very hot up to 400 °C. If a sample is removed whilst the substrate holder is still hot, there is a risk of burns to the user. (Likelihood: 2, Severity: 3). Avoid contact with the furnace base during experiments. The equipment has a water-cooling apparatus and a safe operating procedure which can be integrated with the experimental protocol so that the burns risk and exposure to hot contents is avoided as long as the user follows the rules. Basically, the furnace will be cooled to room temperature before opening it. The cooling function will be entered at the end of the experimental protocol before running the experiment. Wash bottles containing volatile and combustible solvents, such as acetone, ethanol, and isopropanol, are present and used in the lab. (Likelihood: 1, Severity: 2). All solvent bottles will be removed from the vicinity of the DSC before starting experiments. Solvent bottles will not be used near the DSC during experiments.	Low risk MODERATE

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

Lab coat and eye protection (safety specs) required in the lab at all times.

Emergency Instructions & First Aid

General advice: Consult a physician. Show this risk assessment to the doctor in attendance.

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

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

In the case of equipment malfunction/failure, you need to cut off the power supply. Merely closing the control software will not terminate the measurements. To cut off power from the instrument, the power switch is located at the rear of the instrument.

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

Out of hours/Lone working

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Measurements may be done overnight. Once the measurement has been started, the instrument completes the measurements based on the preset procedure. An unattended experiment form must be filed and signed by a designated super user of the DSC, the person in charge of the DSC, or the lab leader for such an experiment to be run. Also requires permission from Head of Division

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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Name of Supervisor Prof. Andrea Ferrari Email: acf26@cam.ac.uk	**Signature**	**Date** 21/11/16

Local Safety Coordinator	**Signature** D Harbu	**Date** 27/10/16
Departmental Safety Office IAN SLACK	**Signature**	**Date** 9 NOV 2016