

Risk Assessment Form

(This is an active document and must be maintained)



UNIVERSITY OF
CAMBRIDGE

Materials Science and Metallurgy

Date: 15th September 2017

Supervisor of Room/Area: **Prof. Serena Best & Prof. Ruth Cameron**

Room or area: **2_014 (CCMM Labs)**
(Describe location)

Name of Assessor(s): **Wayne Skelton-Hough**

Title of Activity / Experiment / Work Area:

Synthesis and production of HA/ α -TCP/ β -TCP (including silicon, carbonate, Zn, Si-Zn or Si-CO₃ HA) samples by precipitation reaction at room temperature and further processing of the precipitate including filtering, drying, pressing into tablets and sintering of the precipitate.

Description of Activity / Experiment / Work Area:

Preparation of HA/ α -TCP/ β -TCP tablets using a precipitation reaction at room temperature followed by filtering, drying, grinding, sieving, pressing and sintering of the resultant reaction products. All stages carried out in the fume cabinets in the CCMM laboratories using standard laboratory equipment.

SECTION 1: Identify all significant hazards, who or what may be affected by each individual hazard and controls in place to reduce risk to a minimum.

Hazard Description	Hazard to whom or what	Controls in place to reduce risk to a minimum
General risks Electrocution	Person carrying out the procedure	Inspect all electrical equipment and power cables before use and do not use any equipment that shows any signs of damage. Ensure electrical equipment carries an up to date PAT test label before using it. Do not switch on electrical equipment if it becomes wet.
Materials preparation Irritation from inhalation of reactants.	All laboratory users	Wear suitable personal protective equipment, including suitable mask if required. Only aliquot sufficient reagents for the experiment. Always add acid to water in a fume hood. Weigh out silicon tetra acetate with local ventilation.
Flash from flammable reactant fumes		Ensure that there are no naked flames or sources of ignition when aliquoting out flammable reactants. Only aliquot out the minimum quantity of reactant required for the reaction and reseal bulk container.

Hazard Description	Hazard to whom or what	Controls in place to reduce risk to a minimum
Burns from orthophosphoric acid or silicon tetra acetate	All laboratory users	Always wear suitable PPE when handling acid (lab coat, chemical apron, arm protectors, stout enclosed footwear, face shield and gloves) and clean up ALL spills straight away using plenty of water (small spill) or chemical spill kit (large spill).
Contact with other unknown chemicals		Ensure the balance and surrounding area is clean before starting to weigh out chemicals. Wear a lab coat and gloves. Clean up any spills immediately as described on the COSHH form.
Heat burns and inhalation of CaO powder		Aliquot CaCO ₃ before decarburizing in a box furnace at 960C. Remove at 100°C and cool CaO in a vacuum desiccator to avoid exposure to moisture before controlled hydration to CaOH ₂ . Wear suitable PPE and use tongs when removing CaO from the furnace at 100°C. Always add CaO to water that is cooled in an ice bath for at least 30 minutes. Perform CaO hydration in a fume hood with no flammable materials nearby. Once CaO powder is added to water the resulting CaOH ₂ solution can be removed from the ice bath and magnetically stirred. The Zn nitrate hexahydrate can be added to the cool CaOH ₂ solution.
HA Synthesis	All laboratory users	Keep all hotplate stirrers well inside the fume hood (so that anything that does spill can be contained within the fume hood bunding). Clean up any spillages that do occur straight away using plenty of water (small spillage) or a proprietary spill kit (large spill). Always wear suitable PPE (see above). Keep stirrer speeds to a minimum to reduce reagent splashing. When bubbling CO ₂ trough the water, use the slowest gas flow possible.
Spillage of orthophosphoric acid solution or calcium hydroxide solution.		
Tipping of overhead stirrer		
Cuts from broken glassware		Dispose of any broken glass wear straight away by carefully putting it in the glass disposal bin.

Hazard Description	Hazard to whom or what	Controls in place to reduce risk to a minimum
Burns from orthophosphoric acid	All laboratory users	Clear up all acid spills immediately using plenty of water (small spillage) or proprietary spill kit (large spill). Always wear suitable PPE (lab coat, chemical apron, arm protectors, face shield, stout enclosed footwear and gloves) and always add acid to water slowly.
Irritation from inhalation of ammonia fumes		Add the minimum amount of ammonia possible to the reaction and only aliquot sufficient ammonia for the experiment inside the confines of the fume hood.
Injury due to long hair or loose items of clothing getting caught up in the electrical stirrer	Person carrying out the procedure	Long hair to be tied up. Lab coat to be worn.
Inhalation of carbon dioxide gas	All laboratory users	Use minimum carbon dioxide gas flow possible. Carry out reaction in a fume hood.
Injury from "whipping" gas line	Person carrying out the procedure	Slowly increase gas flow through the regulator. Only use the minimum gas flow possible.
Filtering	All laboratory users	Place vacuum pump inside a fume hood when applying vacuum to the Buchner flask for filtration. Carefully dispose of supernatant down the sink, diluting with plenty of cold water. Pour off as much supernatant as possible before carrying out filtration. Use a suitable sized Buchner flask, large enough to comfortably accommodate remaining supernatant.
Irritation from inhalation of ammonia fumes		
Supernatant drawn into pump		
Drying	Person carrying out the procedure	Use suitable heat resistant gloves to remove samples from drying cabinet and allow sample to cool to room temperature before further processing.
Burns from drying cupboard and samples		
Grinding dried sample using a pestle and mortar		Cover top of mortar when initially breaking up large sample chunks. Do not be too vigorous when grinding sample. Wear suitable PPE as required.
Flying particles when grinding	All laboratory users	
Irritation from inhalation of HA/ α -TCP/ β -TCP powder		

Hazard Description	Hazard to whom or what	Controls in place to reduce risk to a minimum
Sieving Irritation from inhalation of HA/ α -TCP/ β -TCP powder	All laboratory users	Wear suitable PPE when handling powder as required. Ensure the lid of the sieve shaker is secure before switching on shaker.
Excessive noise from sieve shaker		Ensure lid of sieve shaker is secure before switching on shaker. Watch shaker for the first few minutes of sieving and retighten lid if it loosens off.
Sintering Burns from furnace or sample	Person carrying out the procedure	Ensure furnace has cooled sufficiently so that sample can be handled safely using the appropriate PPE (e.g. heat resistant gloves). Do not open furnace when at high temperature.
Cuts from broken ceramic containers		Ensure you use a suitable container capable of withstanding the sintering temperature. Allow sample and container to cool down sufficiently before removing from the furnace. Clear up any broken ceramic straight away, carefully wrapping the broken ceramic before disposing of in a bin.

SECTION 2: Emergency Procedures

If anyone is burnt (chemical or heat), the affected area should be run under cold water for at least 15 mins. If symptoms continue, medical attention should be sought.

If the operator sustains a cut, it should be cleaned out and medical attention sought.

If the operator or other laboratory user shows signs of exposure to chemicals or fumes, remove to a well-ventilated area and consult the appropriate MSDS and/or COSHH assessment for appropriate emergency action.

In the case of skin/eye exposure to reactants, wash the affected area thoroughly with copious amounts of running water. Remove contaminated clothing and consult the appropriate MSDS and/or COSHH assessment for appropriate emergency action.

If reagents are swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water.

All spillages to be cleaned up immediately using copious amounts of water and paper towel (small spill) or a proprietary chemical spill kit (large spill). If CaO powder is spilled do not clean up with water or acids.

If hair or clothing gets tangled up in the electrical stirrer, isolate equipment at the mains before untangling. Get medical aid if required.

In order to shut down equipment in the case of an emergency, Isolate all electrical equipment at its main sockets. Shut down CO₂ gas bottle at valve.

Signature of Assessor(s)		Date: 15/09/17
Signature of Supervisor		Date: 19/9/17

SECTION 3: Review - This assessment must be reviewed every 12 months or earlier if the basis of the original assessment is altered.

Review Date	Reviewed by (Signature)

Review Date	Reviewed by (Signature)

Change log

Change	Date	Updated by	Description
1	08/04/2016	W. Skelton-Hough	Document issued.
2	11/09/2017	W. Skelton-Hough	Abbreviated risk assessment title added to document footer.
3	15/09/2017	W. Skelton-Hough	Section 3 of risk assessment added back into the document.