STANDARD OPERATING PROCEDURE (SOP) FUSION GAS FURNACE



Fig. 1 FUSION GAS FURNACE

OBJECTIVE

This Standard Operating Procedure (SOP) is specifically designed for the safe operation of the equipment. The equipment operator must read through the procedure thoroughly and should fully understand it before operating the equipment or otherwise consult senior laboratory personnel for any clarifications prior to the operation.

HAZARDS

- Very HOT surfaces High furnace temperature causes the furnace 'FIRE BRICKS' to absorb very high heat to maintain the set temperature. Heat resistant safety gears MUST be worn to minimise server skin burns
- Very humid environment Open windows to allow fresh air into the furnace room to cool down the hot air
- Flammable liquid gas (LPG) Operator(s) to take every precautionary measure to ensure that there is NO gas leakages on the gas supply lines from the Liquid Propane Gas (LPG) cylinder
- **Noise** Medium noise level created by the machine could induce stress or hearing impairment over an extended period of exposure

SAFETY – Personal Protective equipment (PPE)

The following safety gears must be worn when operating the gas fusion furnace;

- Heat resistant overall clothing covering feet
- Heat resistant face shield
- Heat resistant hand gloves
- Safety glasses
- Safety boots

APPARATUS AND MATERIALS REQUIRED

- Loading/unloading thongs
- 'G' size crucibles (pots)
- 'G' pot bench trolley
- Molten sample/slag mould
- Compressed air supply
- Liquid Propane Gas (LPG)
- Permanent marker

REAGENTS

- Litharge (PbO)
- Sodium Carbonate (NaCO3)
- Borax
- Silica (Sio2)
- Potassium Nitrate (KNO4)

STANDARD OPERATING PROCEDURE (SOP)

Pre-start checks

- 1. Ensure that the work environment is clear of any obstructions that may cause safety hazard concerns in the work area
- 2. Ensure that the furnace floor is clean and smooth

- 3. Check gas and compressed air valves are free to operate
- 4. Check LPG 45 kg gas cylinder valve is not leaking any gas
- 5. Ensure that all safety gears (PPE) all set and prepared ready to use

OPERATION OF GAS FUSION FURNACE

- 6. Turn 'ON' the liquid propane gas (LPG) valve at the top of the (45 kg) gas cylinder BY TURNING ANTI CLOCKWISE
- 7. Switch 'ON' the AIR compressor
- 8. Turn 'ON' the air and gas line valves located at the rear (refer to Fig. 3)
- 9. Switch 'ON' the main power supply
- 10. Press the 'RESET' button located at the back of the control panel (refer to Fig. 2)
- 11. Switch the power 'ON' button on the control panel (refer to Fig. 2). It will automatically initialize the furnace settings and proceed to 'IGNITE' the flame
- 12. When the flame is NOT ignited, press the 'RESET' push button again. If the flame is not ignited REPEAT steps 6 12 or otherwise proceed to step 13
- 13. When the flame is ignited, flip the 'HIGH/LOW' burner lever to LOW (refer to Fig. 2)
- 14. Leave the flame at 'LOW' setting until the temperature reaches 200 degrees centigrade
- 15. Set the operating temperature by pressing the 'UP/DOWN' arrow key on the control panel (refer to Fig.2)
- 16. Let the furnace heat up to 200 degrees centigrade
- 17. Switch to 'HIGH BURNER' (refer to Fig. 2)
- 18. Get into your 'SAFETY GEAR'
- 19. Set flame to 'LOW FIRE' (refer to Fig. 2)
- 20. Open the furnace door by pressing the pneumatic control arm foot pad with your foot (refer to Fig. 1)
- 21. Load the labelled fire assay crucibles with sample and pre-mixed flux ('G' pots for **fusion**) into the furnace
- 22. Once the furnace is loaded press the pneumatic arm control foot pad again to close the door
- 23. Remove your SAFETY GEAR
- 24. Switch to 'HIGH FIRE'
- 25. Heat the furnace until the temperature reaches set point
- 26. Once the temperature reach set point, leave the samples to fuse for another 30 minutes
- 27. Clean the fire assay mould and place it on a flat concrete floor
- 28. Get into your APPROPERIATE 'SAFETY GEAR'
- 29. Switch burner flame to 'LOW FIRE'
- 30. Press the pneumatic arm control foot pad again to open the furnace door
- 31. Use a thong to remove the molten material in the crucibles from the furnace
- 32. Pour the molten materials into the metal moulds and leave to cool down
- 33. Close the furnace door by stepping on the pneumatic foot pad again
- 34. Switch 'OFF' the burner (refer to Fig. 2)
- 35. Turn 'OFF' all compressed air and Liquid Propane Gas valves (refer to Fig. 3)
- 36. Close the main LPG valve on the gas cylinder
- 37. Once the molten materials are cooled down, remove the slags and collect the lead buttons
- 38. Shape the lead buttons into cubic shape for 'CUPELLATION'
- 39. Do housekeeping around the work area before leaving

FLAME CONTROL PANEL



Fig. 2 FLAME CONTROL PANEL

FAILURE TO START UP FURNACE, PRESS THE 'RESET BUTTON AT THE BACK OF THE CONTROL PANEL AS SHOWN IN THE PICTURE BELOW. RESTART FURNACE WITH STEP 4



AIR & GAS CONTROL VALVES

FIGURE 3 AIR & GAS VALVES