Lesson Learn

Case Sharing tube furnace	2022-11

I. Case Description

In November 2022, during an experiment in a tube furnace, the valve and the high temperature material inside the tube flew off. The dislodged valve struck the glass tube until it broke. No injuries or other equipment damage caused.

II. What is tube furnace

The tube furnace is an electrically heated unit for the synthesis and purification of inorganic compounds and occasionally for organic synthesis.

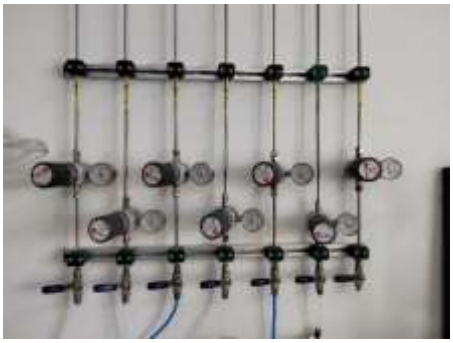
III. What may cause incident

Incident occurred at the temperature increasing period, that gas supply with excessive pressure inside the unit (e.g. broken furnace tubes, flanges flying out, etc.).

IV. How to prevent

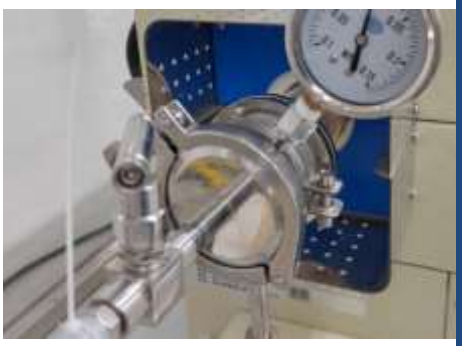
（The following is an example of the model OTF-1200X-SW, specific notes are subject to the actual instrument manufacturer's instructions）

1. The pressure inside the quartz tube (carrier vessel) cannot be higher than 0.02 MPa, but gas supply fromthe high pressure of the cylinder or central gas supply is (12 kg.f/cm2, 12 bar, 170 psi after first stage decompression). When introducing gas from the central gas supply ssytem into the quartz tube (carrier vessel), the front end must be fitted with a pressure reducing valve and flow meter with the appropriate range (required by manufaturer).



2. For sample heating experiments, it is not recommended that the flange of the furnace tube be used with the extraction and inlet valves closed. If you need to close the gas valve to heat the sample, you must strictly follow the manufacturer's pressure requirements for the piping and keep eyes on the pressure gauge, if the pressure is close to the pressure limit, you should open the air relief valve immediately to prevent incident happen.

3. The flange must be correctly mounted to prevent it flying off in case of overpressure in tube. When installing the equipment, ensure all safety accessories are in place.



4. When the furnace temperature is above 1000C, the furnace tube cannot be under vacuum, but should be kept at near atmospheric pressure.
5. The gas flow into the tube furnace should not be higher than 200 SCCM to avoid the impact of the cold gas flow on the heated quartz tube (carrier vessel) and to protect the temperature field inside the furnace at the same time。
6. If a quartz tube is used as the carrier vessel, the temperature should not exceed 1100C for prolonged use (unless the manufacturer has specified the permitted conditions).

V. Daily management and maintenance

1. When installing new or changing experimental gas equipment, it is necessary to consider the scope of use of the equipment and the gas supply conditions to match, and to conduct a risk analysis of the experiments to be carried out.
2. Special experimental operations with gas, hazardous laboratory materials and high temperature and pressure equipment must be carried out in accordance with the equipment manufacturer's guidelines for safe operation and experimental safety.
3. Standard Operating Procedure (SOP) and other warning labels are attached to the equipment indicating the upper and lower temperature and pressure limits for use.
4. Regular inspection of the equipment should be processed, and if the maintenance time is reached, inspection and maintenance of the manufacturer's equipment should be processed.

一定要牢记：拒绝侥幸，忌焦忌躁！

Nothing we do is worth getting hurt for !