

I.3 : Development of special glass cells for laser activity

The Glass Blowing Facility of Accelerator Component Engineering and Fabrication Division has fabricated some special glass cells for specialized applications related to lasers and laser related materials. The details of these are as follows:

a) Cell for growth of KDP crystals :



Fig.I.3.1: Crystal growth cell.

A cell to grow KDP (potassium dihydrogen phosphate) crystals has been fabricated from borosilicate (code 7740) glass. It is a double walled capsule (height : 200mm, outer tube OD : 170mm, inner tube OD : 100mm) with a spiral heating element fused in between the two borosilicate tubes (Fig.I.3.1). A 5 litre borosilicate beaker has been used as the outer tube. The inner tube has 4 ports,

equally placed at the centre. These ports are connected to the outer tubes at right angles. The ports are open from both ends with windows sealed at the inner end. Extra care was taken to prevent over heating of this cell to avoid deformities. Since the cell has 14 ring seals of different sizes, annealing was done at every stage of the ring sealing. This growth cell has been successfully used for the growth of KDP crystals in Laser Materials and Device Development Division.

b) Fabrication of sealed-off copper-bromide laser tube:

A copper-bromide laser uses a sealed-off tube. As it operates at a much lower temperature than a copper vapour laser, the tube is fabricated from a fused quartz tube instead of using a ceramic tube. For the Cu-Br laser being developed at Laser System Engineering Division, a sealed-off fused quartz tube of 60mm diameter and 2450mm length has been fabricated. The laser tube has optically polished windows sealed at the two opposite ends. Seventeen quartz rings are sealed inside the tube, right angle to the tube axis, at equal intervals. Alignment of quartz rings is very critical and of utmost importance. Special jigs and fixtures were developed to attain such a level of alignment. The tube has 17 sample holding quartz tubes, sealed in between the quartz rings. Two tungsten electrodes are sealed at two ends of the tube. Sealing of both the quartz rings and windows was carried out under vacuum. As working with fused silica (quartz) is very difficult and hazardous, extra care was taken to avoid inhalation of evaporated silica. Also to avoid exposure to the ultraviolet emission at the quartz melting temperature, special safety goggles were used during fabrication process. The laser tube was tested to a leak rate of 10^{-9} torr-litre/sec. Fig. I.3.2 shows a photograph of this cell.

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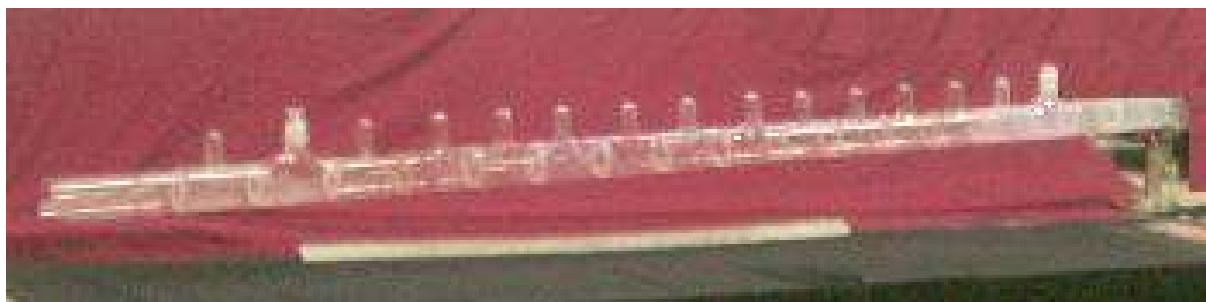


Fig. I.3.2 : Copper-bromide laser tube.