by etching the oxide layer using hydrofluoric acid (HF). This was found to narrow the spectral band width of the luminescence but not the peak wavelength, since the silicon crystalline core itself would clearly not be affected by such treatment with HF. The effect of passivation on the fluorescence intensity, but not on the fluorescence wavelength, is in line with earlier work by Seraphin and co-workers (Seraphin et al., 1996).

Pyrolysis of silane in vacuum was also used by Li and co-workers to produce silicon clusters (Li et al., 2004b,a), who post-processed the samples by etching with hydrofluoric acid (HF) and nitric acid (HNO_3). This was found to reduce the cluster size and the intensity of visible luminescence.

1.6 Blue fluorescence

To investigate the effect of passivation of silicon clusters in situ, von Haeften and co-workers used a molecular beam co-deposition scheme (von Haeften et al., 2009). They produced silicon clusters by gas aggregation using ion sputtering in an argon-helium atmosphere, co-depositing them with a beam of water vapour onto a liquid nitrogen-cooled target. After a deposition time of 30 minutes, the target was warmed up, whereupon the ice-silicon mixture melted and a few millilitres of liquid sample was collected. A schematic of the apparatus used is shown in figure 1.5.

When photoexcited with 308 nm UV light, all liquid samples showed a blue fluorescence that peaked at 420 nm (von Haeften et al., 2009). The fluorescence intensity was stable over several months (Brewer and von Haeften, 2009). When the photoexcitation wavelength was decreased from 310 to 240 nm, the wavelength of the fluorescent band remained at 420 nm; however, additional fluorescence bands appeared in the UV region (von Haeften et al., 2010a,b; Torricelli et al., 2011). When the clusters were embedded in liquid ethanol and