material. Silicon fluoride is hydrogenated to monosilane by metal hydrides such as lithium aluminium hydride or sodium aluminium hydride.

$$2H_2 + M + Al = AlMH_4, \text{ M being Na or Li} \tag{5.37}$$

$$SiF_4 + AlMH_4 = SiH_4 + AlMF_4 \tag{5.38}$$

$AlMF_4$ is believed to find application in the aluminium industry, making it a valuable saleable product.

After distillation, monosilane SiH_4 is thermally decomposed to polysilicon as described by (5.36). However, to realise this process, Ethyl Corporation introduced a second radical change, not using static silicon seed rods in a bell-jar reactor but dynamic silicon seed spheres in a fluidised bed sustained by a gas stream of silane and hydrogen. A schematic representation of a fluidised bed reactor is given in Figure 5.5.

The fluidised bed reactor offers some significant advantages compared to the bell-jar reactor. Most of the shortcomings identified for the Siemens process are then eliminated. The energy losses and hence the energy consumption are considerably reduced because the decomposition operates at a lower temperature and because the same requirement to cool the bell jar is not there. Another advantage is that large reactors may be constructed and operated continuously, reducing further the capital and operating costs.

The end products are small granules of polysilicon that may present some advantages (e.g. when continuous feeding in customer process is requested) or disadvantages (e.g. not usable for direct float zone crystallisation).

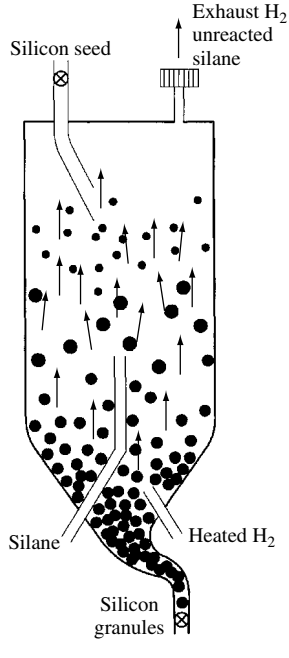

Figure 5.5 A schematic representation of a fluidised bed reactor for polysilicon production