for several minutes in an inert or reducing ambient, in a process known as *sintering*. However, the use of pure aluminium can result in significant silicon diffusion into the aluminium layer during the sintering step. The resulting interface structure resembles the formation of aluminium spikes into the underlying silicon which may penetrate the doped junction (particularly if it is submicron in depth). This phenomenon is known as 'junction spiking'.

The most reliable method for the elimination of junction spiking is the incorporation of a diffusion barrier layer between the aluminium and the silicon. This thin layer must be able to prevent significant diffusion at the sinter temperature, have low electrical resistivity and possess good adhesion properties to both the Si and Al (or whatever metal is being used as a contact). Two of the most common barrier layers are titanium tungsten (TiW) and titanium nitride (TiN), although a thin layer of $TiSi_2$ is required below TiN to reduce the contact resistance.

5.7 SUMMARY

The development of silicon photonic fabrication benefits greatly from the vast library of knowledge that already exists in the silicon microelectronics industry. In this chapter we have described the basic steps in the formation of an integrated silicon photonic device and acknowledge that we have merely glimpsed at the general area of silicon fabrication. Our emphasis has been skewed towards fabrication in academic and research environments where much of the near-term device development will be performed. We concede that as with any fast-moving technology, silicon photonic processing will find a path of least resistance which may make some of the processes described here redundant and necessitate the use of methods not described (for instance in the inevitable development of submicron devices). However, the overall process flow and much of the detail of this chapter will remain relevant for many years to come.

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