**Table 5.4** Metallurgical silicon expected characteristics if upgraded with best currently known metallurgical technology

| Impurity | Target concentration [ppm(w)] | Target price [US$/kg] |
|---|---|---|
| Fe | 50 | 5–7 |
| Al | 50 | |
| Ca | 50 | |
| Ti | 5 | |
| C | 50 | |
| B | 7 | |
| P | 7 | |
| O | 200 | |
| Other impurities | Less than 5 | |

**Table 5.5** Specification of chemical impurities in lowest-grade silicon currently purchased to produce multicrystalline silicon wafers

| Impurity | Specification |
|---|---|
| Fe, Al, Ca, Ti, metallic impurities | Less than 0.1 ppm(w) each |
| C | Less than 4 ppm(w) |
| O | Less than 5 ppm(w) |
| B | Less than 0.3 ppm(w) |
| P | Less than 0.1 ppm(w) |

**Table 5.6** Electrical specification of lowest-grade silicon currently purchased to produce multicrystalline silicon wafers

| Property | Specification |
|---|---|
| Resistivity | Higher than 1 ohm cm, *p*-type |
| Minority-carrier lifetime | Higher than 25 μs |

as tentatively indicated in Table 5.4. However, impurity contents, particularly boron and phosphorus, prevent the use of such material in solar cells. The current minimum purity requested for growing multicrystalline silicon ingots for wafering is given in Tables 5.5 and 5.6.

For semiconductor grade silicon, impurity levels are at least at the ppb level and resistivity within 1000 to 30 000 ohm cm. Although purity requirements for solar cells are not as stringent as for semiconductors, the industry has up to now been forced to select its silicon raw material from the semiconductor silicon source. Silicon is one of the main, if not the largest, cost drivers of the installed PV system. It accounts for approximately 25% of the wafer cost and 15% of the cell cost. Taking into account the dominant share of silicon crystalline technology, the industry is very sensitive to the silicon