Whereas, Figure 18.18 yields a "measured" μ_e of 0.06 m^2/V-s, which is higher than the "calculated" value. Therefore, the correct impurity concentration will lie somewhere between 10^{22} and 10^{23} m^{-3} probably closer to the lower of these two values. At 1.3 x 10^{22} m^{-3}, both "measured" and "calculated" μ_e values are about equal (0.095 m^2/V-s).

It next becomes necessary to calculate the concentration of donor impurities in atom percent. This computation first requires the determination of the number of silicon atoms per cubic meter, N_{Si}, using Equation 4.2, which is as follows

$$N_{\text{Si}} = \frac{N_{\text{A}} \rho'_{\text{Si}}}{A_{\text{Si}}}$$

$$= \frac{(6.023 \text{ x } 10^{23} \text{ atoms/mol})(2.33 \text{ g/cm}^3)(10^6 \text{ cm}^3/\text{m}^3)}{28.09 \text{ g/mol}}$$

$$= 5 \text{ x } 10^{28} \text{ m}^{-3}$$

(Note: in the above discussion, the density of silicon is represented by ρ'_{Si} in order to avoid confusion with resistivity, which is designated by ρ.)

The concentration of donor impurities in atom percent (C'_d) is just the ratio of N_d and (N_d + N_{Si}) multiplied by 100 as

$$C'_d = \frac{N_d}{N_d + N_{\text{Si}}} \text{ x } 100$$

$$= \frac{1.3 \text{ x } 10^{22} \text{ m}^{-3}}{(1.3 \text{ x } 10^{22} \text{ m}^{-3}) + (5 \text{ x } 10^{28} \text{ m}^{-3})} \text{ x } 100 = 2.6 \text{ x } 10^{-5} \text{ at\%}$$

Now, conversion to weight percent (C_d) is possible using Equation 4.7a as

$$C_d = \frac{C'_d A_d}{C'_d A_d + C'_{\text{Si}} A_{\text{Si}}} \text{ x } 100$$

where A_d and A_{Si} are the atomic weights of the donor and silicon, respectively. Thus, the concentration in weight percent will depend on the particular donor type. For example, for nitrogen