Table I. $E^{\mathrm{m}}_{\mathrm{pair}} \approx (E^{\mathrm{a}}_{\mathrm{pair}})$, $E^{\mathrm{bLL}}_{\mathrm{pair}}$, $E^{\mathrm{b}}_{\mathrm{pair}}$, and $E^{\mathrm{D}}_{\mathrm{imp}}$ in eV, and $f^{\mathrm{I}}_{\mathrm{imp}}$. $E^{\mathrm{f}}_{\mathrm{V}} = 4.24\,\mathrm{eV}$ [5]

Impurity-vacancy pair				Impurity diffusion		
	$E^{\mathrm{m}}_{\mathrm{pair}} \approx (E^{\mathrm{a}}_{\mathrm{pair}})$	$E^{\mathrm{bLL}}_{\mathrm{pair}}$	$E^{\mathrm{b}}_{\mathrm{pair}}$		$E^{\mathrm{D}}_{\mathrm{imp}}$	$f^{\mathrm{I}}_{\mathrm{imp}}$
(PV)	0.93[1] (0.94[3])	1.04[3]	1.87[5]	P	3.30[4]	0.6 – 0.8 [7] 0.86 – 0.96 [8,9]
(AsV)	1.07[2] (1.07[3])	1.23[3]	1.87[5]	As	3.44[4]	0.6 [7]
(SbV)	1.29[2] (1.28[3])	1.44[3]	1.88[5]	Sb	3.65[4]	0.015 [10]
(BiV)	(1.46[3])	1.64[3]	1.85[5]	Bi	3.85[4]	

4. Interstitialcy Mechanism of Impurity Diffusion

Extrinsic stacking faults are generated and the diffusion of P and As is enhanced by the oxidation of the Si specimen. Therefore, it has been proposed [6] that both P and As diffuse by the dual mechanism of vacancy and interstitialcy (I).

The fractions of the interstitialcy component in the diffusion of P ($f^{\mathrm{I}}_{\mathrm{P}}$) [7] [8,9], of As ($f^{\mathrm{I}}_{\mathrm{As}}$) [7], and of Sb ($f^{\mathrm{I}}_{\mathrm{Sb}}$) [10] are shown in Table I. *Statement 2:* "Based on these, it has been concluded [7-9] that the interstitialcy mechanism is dominant in P and As diffusion. "

5. Conclusion

Statement 1 in §3 and *Statement 2* in §4 are inconsistent. Currently, little is known about P-I and As-I pairs. Therefore, by applying Watkins' model to the interstitialcy mechanism, $E^{\mathrm{m}}_{(\mathrm{PV})^0} + E^{\mathrm{f}}_{\mathrm{V}} \approx E^{\mathrm{m}}_{(\mathrm{PI})^0} + E^{\mathrm{f}}_{\mathrm{I}}$ and $E^{\mathrm{m}}_{(\mathrm{AsV})^0} + E^{\mathrm{f}}_{\mathrm{V}} \approx E^{\mathrm{m}}_{(\mathrm{AsI})^0} + E^{\mathrm{f}}_{\mathrm{I}}$ can be obtained from eq. (1), where $E^{\mathrm{m}}_{(\mathrm{PI})^0}$ and $E^{\mathrm{m}}_{(\mathrm{AsI})^0}$ are the migration energies of P-I and As-I pairs, and $E^{\mathrm{f}}_{\mathrm{I}}$ is the formation energy of the self-interstitial.

References

[1] G. D. Watkins and J. W. Corbett: Phys. Rev. **134** (1964) A1359.

[2] E. L Elkin and G. D. Watkins: Phys. Rev. **174** (1968) 881.

[3] M. Hirata, M. Hirata, and H. Saito: J. Phys. Soc. Jpn. **27** (1969) 405.

[4] R. N. Ghoshtagore: Phys. Rev **B 3** (1971) 389, 397.

[5] M. Yoshida and R. R. Hasiguti: *Radiation Damage and Defects in Semiconductors, Reading, 1972* (Inst. Phys., London, 1973) Conf. Ser. 16, p. 223.

[6] S. M. Hu: J. Appl. Phys. **45** (1974) 1567.

[7] Y. Ishikawa, Y. Sakina, H. Tanaka, S. Matsumoto, and T. Niimi: J. Electrochem. Soc. **129** (1982) 644.

[8] T. Shimizu, T. Takagi, S. Matsumoto, Y. Sato, E. Arai, and T. Abe: Jpn. J. Appl. Phys. **37** (1998) 1184.

[9] S. Tanaka, M. Morooka, M. Yoshida, and S. Matsumoto: Res. Bull. Fukuoka Inst. Tech. **38** (2005) 1.

[10] D. A. Antoniadis and I. Moskowitz: J. Appl. Phys. **53** (1982) 6788.