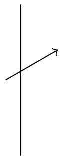
1 Introduction



The general model for the elastic energy per unit length for a mixed dislocation dissociated into two partials can be given as [1]:

$$E_D(\theta) = E_S(\theta) + E_I(\theta) + E_F(\theta) \tag{1}$$

"E_S" is the self-energy of the two partials, "E_I" is the interaction energy (of the two partials), and "E_F" is the fault-energy. "θ" is the angle between the Burgers vector and the unit line vector.

A general expression can be given for each energy.

$$E_S(\theta) = \frac{\mu b^2}{4\pi}\left(1 - \nu \cos^2\theta\right) \ln\left(\frac{R}{r_0}\right) \tag{2a}$$

$$E_I(\theta) = \frac{\mu b^2}{2\pi}\left(\alpha + \frac{\beta}{1-\nu}\right) \ln\left(\frac{R}{\Delta}\right) - \frac{\mu}{2\pi(1-\nu)}\psi \tag{2b}$$

$$E_F = \gamma\Delta \tag{2c}$$

r_0 and R are the inner and outer cutoff radii, respectively. μ, b, and ν are the shear modulus, the Burgers vector of the dislocation, and the Poisson ratio.

Equation 2b is the interaction energy between two parallel dislocation segments separated by a vector $\vec{\Delta}$. α, β, and ψ are related to the Burgers vectors and the line direction vectors of the two dislocations. Δ is the vector pointing from one dislocation segment to the second.

γ is the stacking-fault energy

2 Mixed Shockley dislocation $\beta \pm \pi/6$

References

[1] D. J. Bacon. The effect of dissociation on dislocation energy and line tension. *Philosophical Magazine A*, 38(3):333–339, 1978.