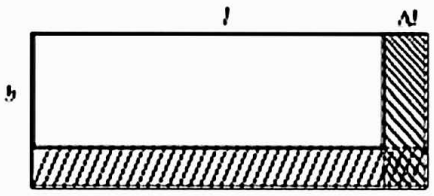
Assignment

Show that the coefficient of area expansion of a rectangular sheet of solid is twice its linear expansivity

Ans)



Consider a rectangular plate of length l and breath b when its temperature is increased by ΔT, its length increases by Δl and breath increased by Δb.
Therefore, the change in area is,

$$\Delta A = l\Delta b + b\Delta l + \Delta l\Delta b$$

$$= l[b\alpha\Delta T] + b[l\alpha\Delta T] + [l\alpha\Delta T][b\alpha\Delta T$$

$$= lb\alpha T + bl\alpha\Delta T + lb\alpha^2(\Delta T)^2$$

Here α being very small, α^2 can be neglected.

Therefore,

$$\Delta A = lb(\alpha + \alpha)\Delta T = A(2\alpha)\Delta T$$

$$\implies \frac{\Delta A/A}{\Delta T} = 2\alpha$$