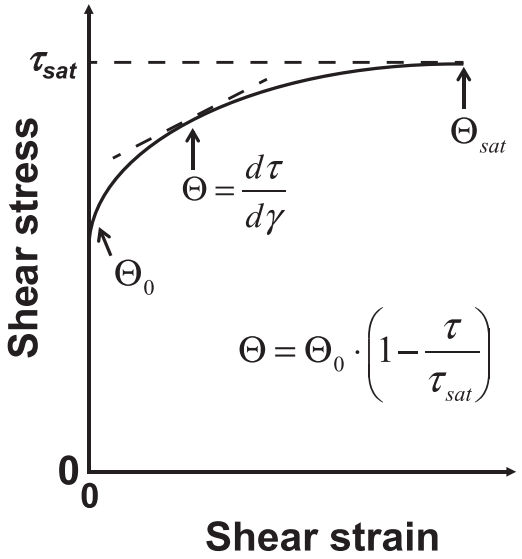

Fig. 6.13 Schematic illustrating the main parameters of the strain hardening Eq. 6.23.

2. The density of mobile dislocations does not vary with time:

$$d\rho_m \approx 0$$
$$d\rho_d \approx d\rho_i \qquad \text{(Eq. 6.26)}$$

The immobile dislocation density, ρ_i, increases steadily during deformation, and the density of mobile dislocations, ρ_m, remains constant and small relative to the immobile dislocation density. The increase of the total dislocation density is, therefore, solely due to the accumulation of immobile dislocations, caused by the arrest of mobile dislocations at strong obstacles that the mobile dislocations cannot cut through.

Assuming that ρ_m mobile dislocations are generated per unit volume at a dislocation source, the source produces mobile dislocations constantly. The mobile dislocations move a mean distance λ, the dislocation mean free path, and they are immobilized at obstacles. Once the mobile dislocations are immobilized at an obstacle, the density of immobile dislocations increases. The schematic of Fig. 6.14 illustrates this mechanism.

Fig. 6.15 illustrates how the movement over a distance dx of ρ_m mobile dislocations in a unit volume produces a shear strain equal to $d\gamma$:

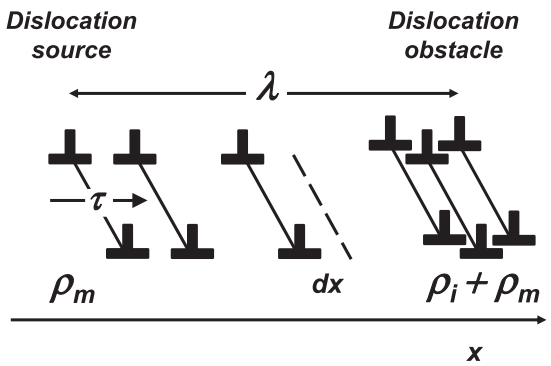

Fig. 6.14 Schematic illustrating the process whereby mobile dislocations are constantly produced at a dislocation source, move a distance λ and are immobilized at an obstacle. Once immobilized, the mobile dislocations contribute to increasing the immobilized dislocation density.