PHYSICS OF MATERIALS

Physics School Autumn 2025

Series 7 **31 October 2025**

Exercise 1: Interaction force between edge dislocations

Calculate the interaction force between two parallel edge dislocations on two different slip systems. Then analyze the forces and sketch their directions in the plane containing the Burgers vectors (e.g., x-y). For this simplified case, consider two parallel Burgers vectors.

Exercise 2: Interaction force between an edge and a screw dislocation

Calculate the interaction force between an edge dislocation and a screw dislocation that are perpendicular. Analyze the forces in the case where the Burgers vectors are parallel.

Exercise 3: Dissociation and formation of dislocations in f.c.c. metals

Use the drawing of the Thompson tetrahedron attached to draw:

The formation of a Frank sessile dislocation

The formation of a Lomer lock

The formation of a Lomer-Cottrell lock (stair rod)

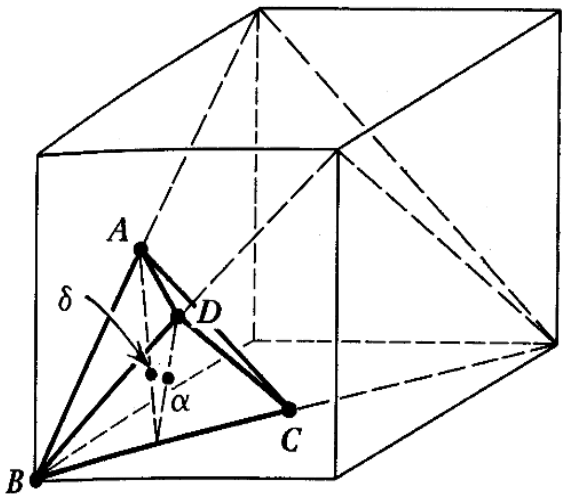
We define:

$AB = \frac{a}{2}[\bar{1}10]$ perfect dislocation

$A\delta = \frac{a}{6}[\bar{1}2\bar{1}]$ partial dislocation (Shockley)

$\delta B = \frac{a}{6}[\bar{2}11]$ partial dislocation (Shockley)

$A\alpha = \frac{a}{3}[\bar{1}1\bar{1}]$ Frank partial dislocation



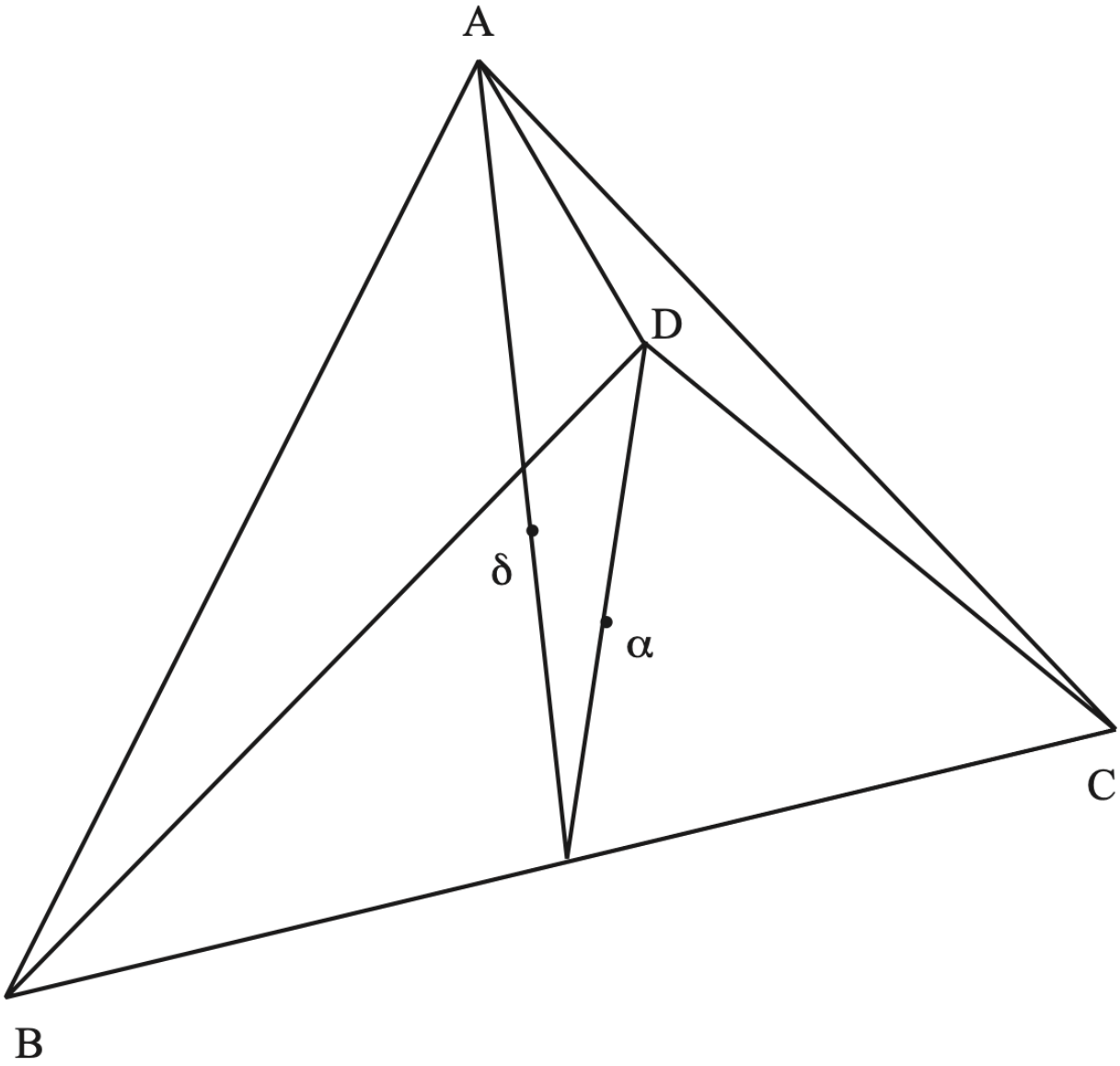


Fig. 8.1 Thompson tetrahedron in the f.c.c. cell with