

Bi $Z=83$, group VA ; structure: RHL

two atoms per unit cell \Rightarrow 10 electrons per unit cell

Bi has:

- the **highest Hall coefficient**, $R_H = -1/(nec)$, is several orders of magnitude higher than expected with that n .
- the **second lowest thermal conductivity** (after Hg)
- a **high electrical resistance** (or low electrical conductivity)
(look for instance at Tab 1.2 and 1.6 of A&M)

Why?

Is the “effective” electron concentration n for some reason much lower than the calculated one?

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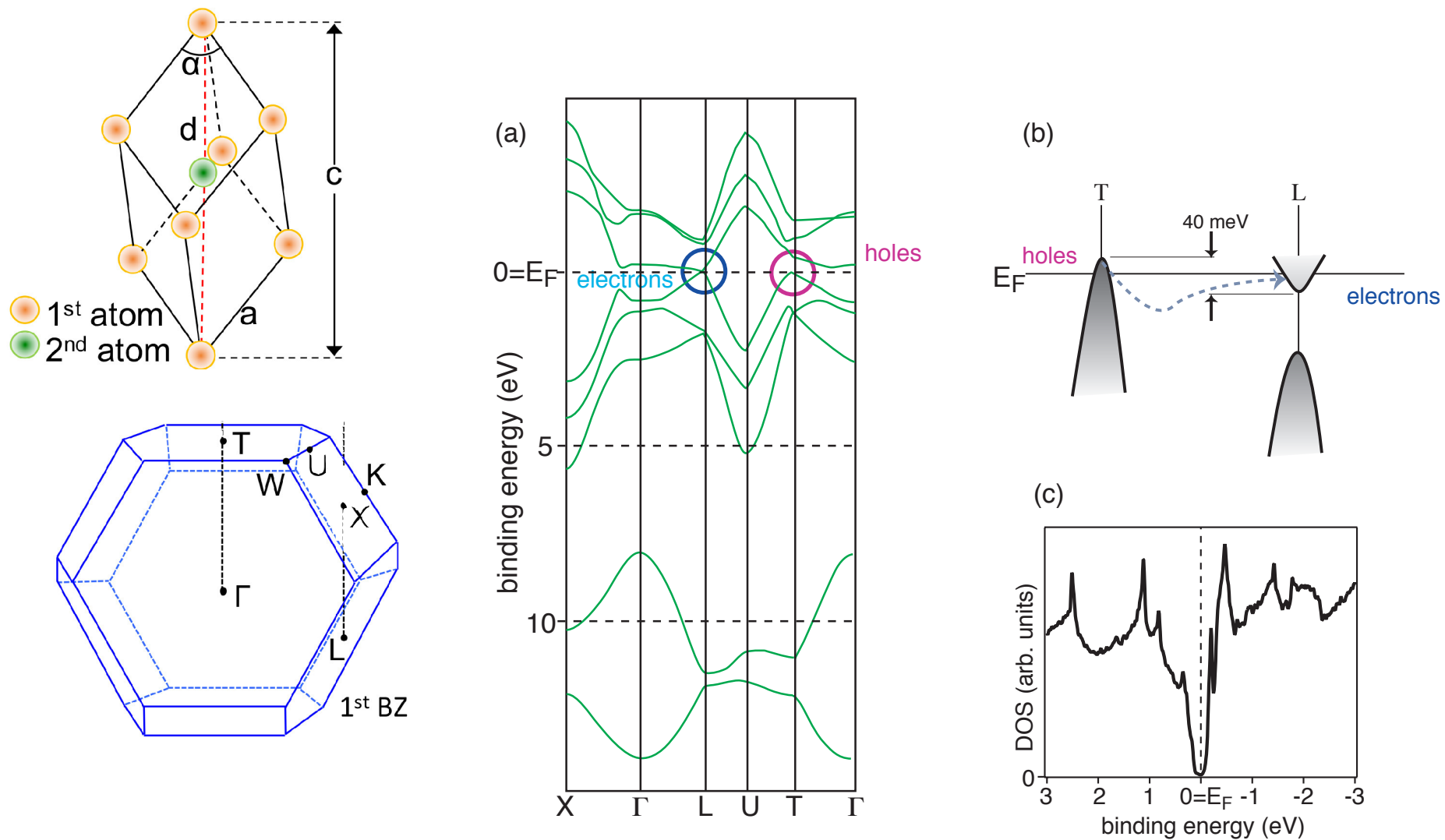


Figure 1: Electronic structure of Bismuth. (a) Bulk band dispersion in different directions of the Brillouin zone (b) Schematic band structure of the bands crossing the Fermi energy. (c) Density of states.

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The effect of the presence of both holes and electrons on the Hall constant can be understood qualitatively from the expression for R_H :

$$R_H = \frac{p\mu_h^2 - n\mu_e^2}{e(p\mu_h + n\mu_e)^2}$$

(see: Ashcroft-Mermin: problem 12.4;

written test of January 16, 2012 - problem n. 3)

(qualitative picture!)

