

## Exercise 4.1-1

### Quick Questions to

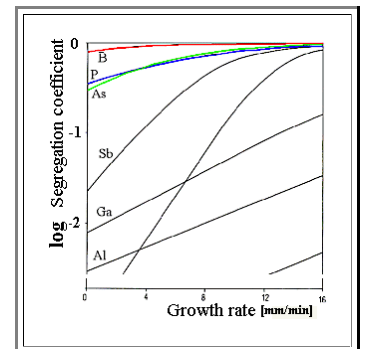
#### 4.1 Input to Si Processing in an Industrial Environment

Here are some quick questions:

- List (and discuss briefly) some essential inputs to a chip factory.
- What is the essential process for producing raw (= metallurgical) **Si** and what is the major use for this **Si**?
- Go through the essential of **Si** single crystal growth by the **CZ** technique. Give numbers and discuss in-situ doping, keeping the crystal dislocations-free, and any remaining problems.
- Describe shortly the essentials of how to obtain clean, doped poly-**Si** as needed for single crystal growth
- Where and why is a **CVD** process involved in making electronic grade **Si**?
- Describe the phenomenon of segregation. How does it impact **Si** crystal growth?

Given the diagram on the right, discuss:

- What a segregation coefficient of , e.g.,  $10^{-2}$  means in terms of the concentration in the crystal in the beginning and the end of the crystal growth process if the initial concentration in the melt is  $10^{-6}$
- Why you prefer **As** to **Sb** as a dopant during crystal growth .



- Why is extreme flatness an essential condition for standard **Si** wafers?
- Why is it possible to keep wafers completely free of dislocations, but not of "microdefects" = agglomerates of point defects?