# 3.40J / 22.71J
# Modern Physical Metallurgy
## KJ Van Vliet and KC Russell

## Lecture 5: Introduction to 2D defects

### February 24, 2004
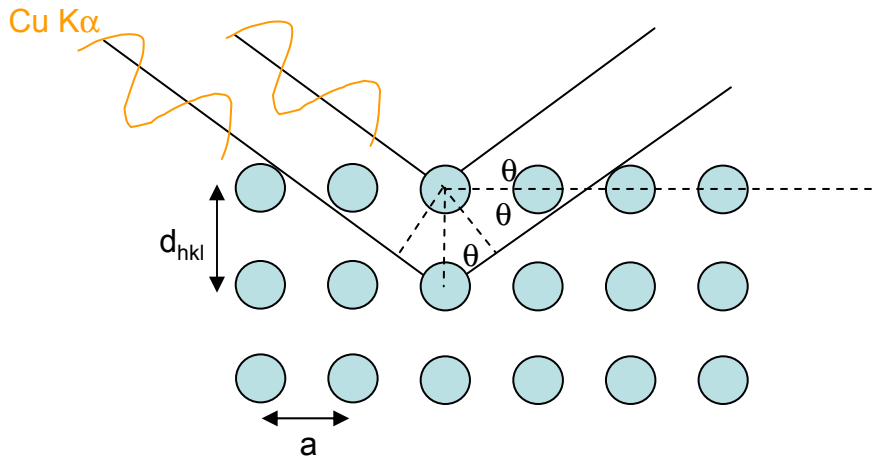
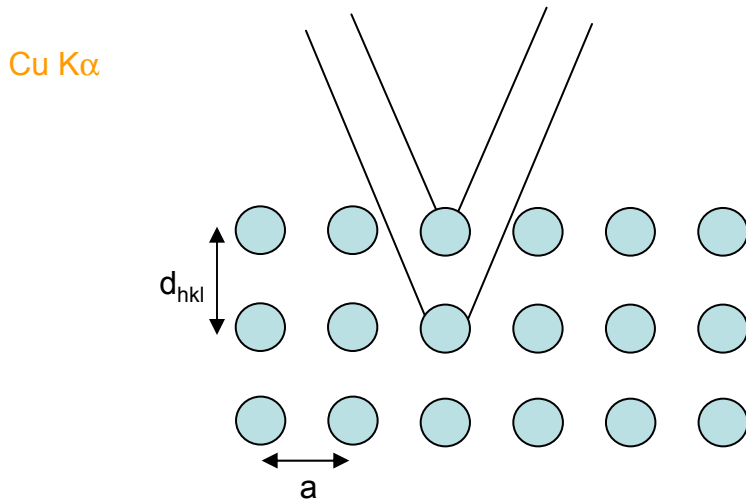Clarification from PS1:
First-order diffraction: n = 1
Second-order diffraction: n = 2



$n\lambda = 2d_{hkl}\sin(\theta) \rightarrow$

Can be several $\theta$ that satisfy this condition for the same set of planes!
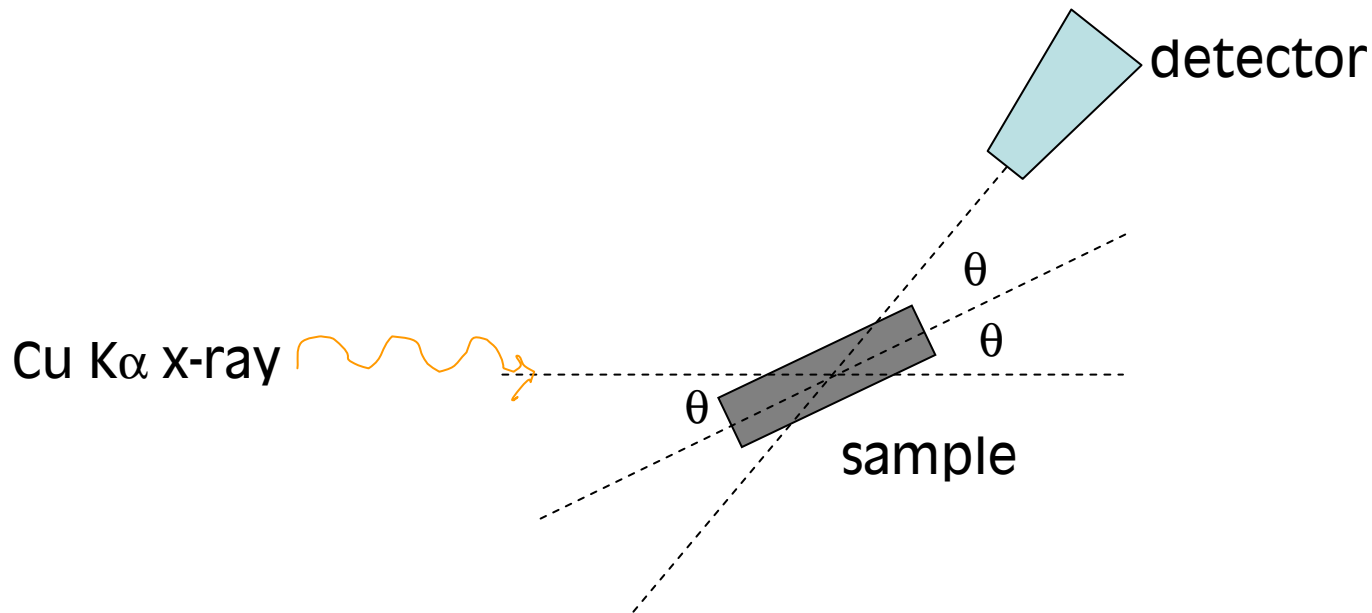
<u>Clarification from PS1:</u>

First-order diffraction: $n = 1$

Second-order diffraction: $n = 2$

Q: What order is contained in an XRD spectrum?

A: $n = 1$ for all peaks

Reason: X-Ray Diffractometer rotates the crystal and the detector, with detector positioned q away and moving twice as fast. This means that the detector only picks up the lower incident angle (ie, $n = 1$) reflections.

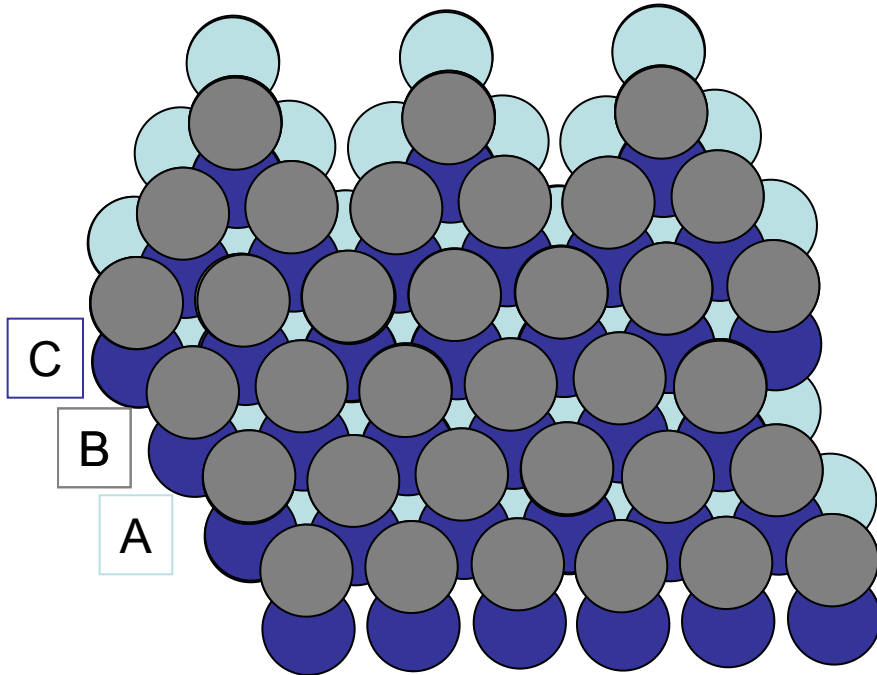Types of 2D defects, or dislocations in perfect crystalline order:
- Stacking faults
- Twins
- Edge dislocations
- Screw dislocations

# Stacking fault

Stack close-packed planes in wrong sequence
Creates extra or missing plane inside the crystal

FCC stacking: ABCABCABC

## Edge dislocation

Definitions:
      (1) Extra half-plane of atoms inserted in otherwise perfect crystal
      (2) Boundary between sheared and unsheared regions on slip plane