APPLICATIONS OF XRD

1. Structure of crystals
2. Polymer characterisation
3. State of anneal in metals
4. Particle size determination

a) Spot counting method
b) Broadening of diffraction lines
c) Low-angle scattering

5. Applications of diffraction methods to complexes

a) Determination of cis-trans isomerism
b) Determination of linkage isomerism

6. Miscellaneous applications

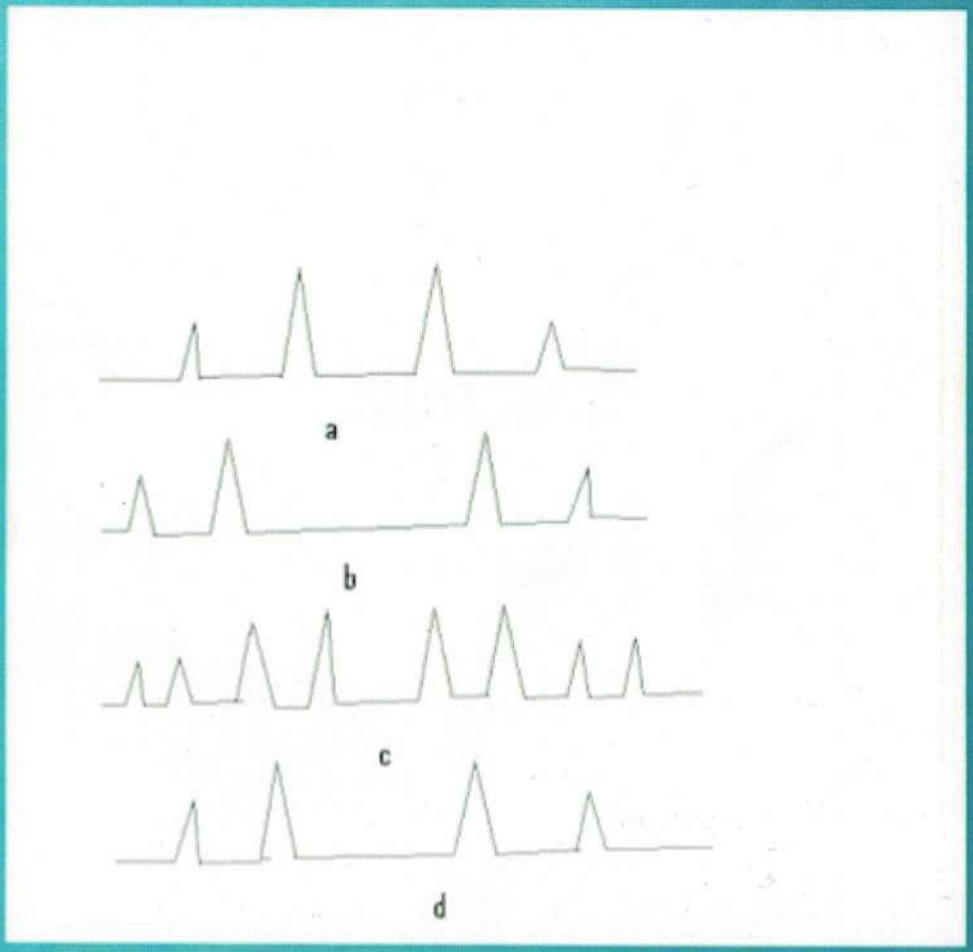
1.STRUCTURE OF CRYSTALS

a-x-ray pattern of salt Nacl

b-x-ray pattern of salt Kcl

c-x-ray pattern of mixture of Nacl &Kcl

d-x-ray pattern of a powder mixed crystal of Nacl & Kcl



2.POLYMER CHARACTERISATION

- Determine degree of crystanillity
- Non-crystalline portion scatters x-ray beam to give a continuous background(amorphous materials)
- Crystalline portion causes diffraction lines that are not continuous.(crystalline materials)

3.State of anneal in metals: XRD is used to to test the metals without removing the part from its position and without weakening it.

4.PARTICLE SIZE DETERMINATION

Spot counting method:

$$v = V.\delta\theta.\cos\theta/2n$$

v=volume of individual crystallite
V=total volume irradiated
n=no. of spots in diffraction ring
$\delta\theta$ =divergence of x-ray beam

MISCELLANEOUS APPLICATIONS

- Soil classification based on crystallinity
- Analysis of industrial dusts
- Assessment of weathering & degradation of minerals & polymers
- Study of corrosion products
- Examination of tooth enamel & dentine
- Examination of bone state & tissue state
- Structure of DNA&RNA

CONCLUSIONS

- For materials including metals, minerals, plastics, pharmaceuticals and semiconductors XRD apparatus provide highly accurate tools for non-destructive analysis.
- The diffraction systems are also supported by an extensive range of application software

4.0 Applications of XRD

- XRD is a nondestructive technique
- To identify crystalline phases and orientation
- To determine structural properties:

  Lattice parameters (10^{-4}Å), strain, grain size, expitaxy, phase composition, preferred orientation (Laue) order-disorder transformation, thermal expansion
- To measure thickness of thin films and multi-layers*
- To determine atomic arrangement
- Detection limits: ~3% in a two phase mixture; can be ~0.1% with synchrotron radiation

  Spatial resolution: normally none