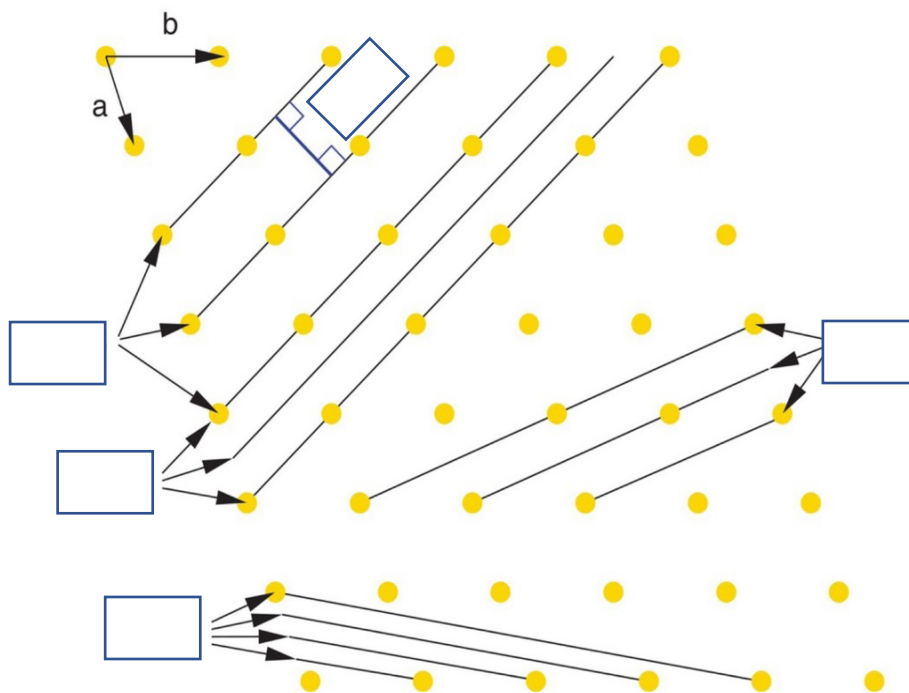


CH314 – Structural Analysis

Part III : X-ray Tools

Exercise 2

1) Identify the lattice planes



2) Which diffraction pattern do you attribute to a) single crystal b) powder c) nanocrystalline powder



3) You perform a powder diffraction experiment on your colloidal gold nanoparticles. From the data, figure out if your particles are spherical or if they have a preferred axis. Consider the Debye-Scherrer formalism.



Use of wide-angle X-ray diffraction to measure shape and size of dispersed colloidal particles

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The diffraction experiments were carried out with a Stoe STADI-P X-ray powder diffractometer at University College London with a Ge(111) monochromator before the sample. A Cu $K\alpha_1$ X-ray beam of wavelength 0.154056 nm was used. The samples were measured in 0.35 mm diameter glass capillaries at room temperature. Capillary diameters were checked to be equal with a micrometer. The diffraction patterns were collected using a position-sensitive

Table 2

Results from the pseudo-Voigt fit to the Au particles. 2θ is the peak position for the Cu $K\alpha_1$ radiation wavelength (0.154056 nm).

hkl	Bragg angle 2θ (°)	Peak width ' β ' (°)	Instrument resolution (°)	Corrected β (°)
111	38.21	0.580	0.114	0.47
200	44.34	0.822	0.115	0.71
220	64.69	0.810	0.123	0.68
311	77.63	0.905	0.135	0.77
420	115.34	1.194	0.119	1.07