FYSC23

PXRD lab

Authors
Fredrik Bergelv
Max Eriksson
fredrik.bergelv@live.se
maxerikss@gmail.com

LUND UNIVERSITY

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2.1 Crystal Lattice Structure

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Transmission, fluorescence,

Xray diffraction, oscillating E field. When X ray hit the electrons the electrons start o vibrate in that frequency - Constructive and destructive interference

Bragg's law: $n\lambda = PD = 2s = 2d\sin\theta$

Crystal lattice: fcc, bcc

In powder diffraction we have all possible orientation sof the crystallites and some will be oriented in the right way for diffraction. Give rise to powder diffraction rings.

Scherrer's formula

$$t = \frac{k\lambda}{\beta\cos\theta} \tag{1}$$

Structure factor: Se photos. For a simple cubic we see all peaks, for bcc and fcc we loose some peaks.

3 Method

The energy of the x-rays are 17.45 keV.

The detector uses six semiconductors.

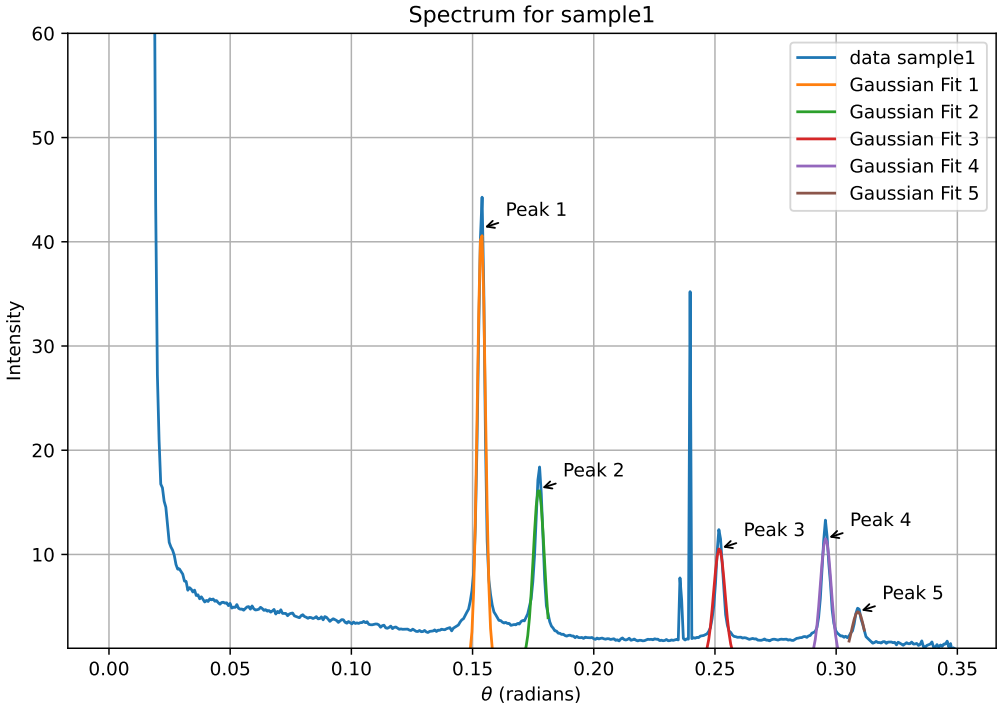
Calibrations of hex.., this is good since we have a lot of diffraction rings.

1. Put in all the data 2. mask out dead spots 3. Tell where the rings are 4. The image is converted to an

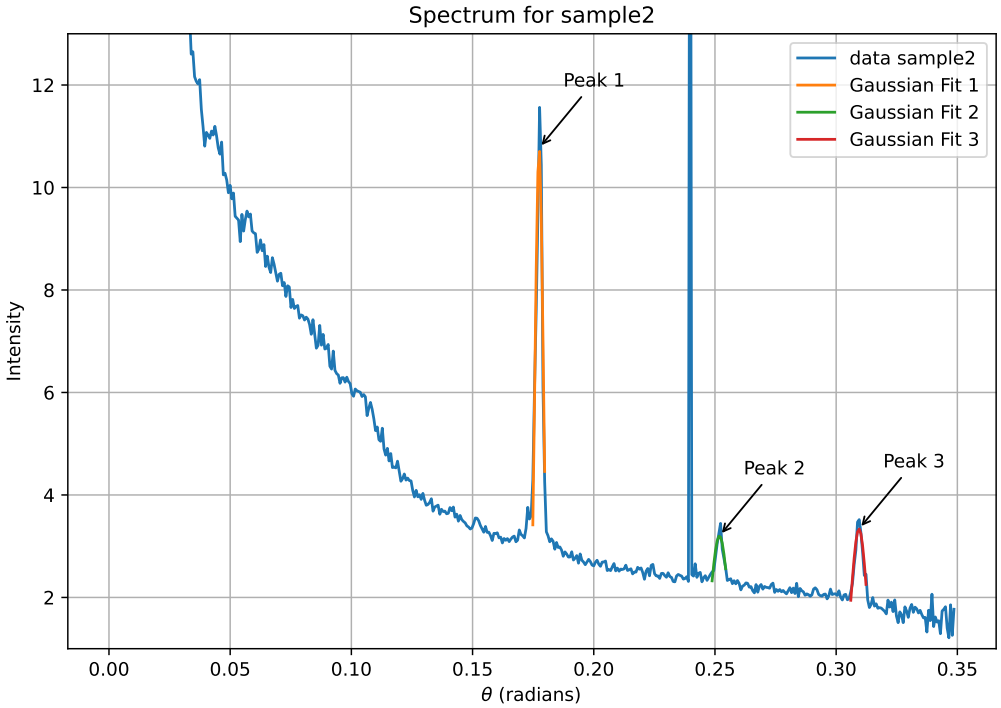
intensity plot (Note that the x-axis is in 2θ).

Hot pixel, high peak with no width. The pixel can be burnt out.

4 Result



(a) This is the first subfigure.



(b) This is the second subfigure.

Figure 1: This figure shows two subfigures with separate captions.

1. For sample1:
   (a) Peak 1: Amplitude = 41.29 ± 2.15 (units), Mean = 0.15362 ± 0.00010 (radians), Sigma = 0.00165 ± 0.00010 (radians), FWHM = 0.00388 ± 0.00023 (radians)
   (b) Peak 2: Amplitude = 16.28 ± 1.14 (units), Mean = 0.17731 ± 0.00019 (radians), Sigma = 0.00227 ± 0.00020 (radians), FWHM = 0.00535 ± 0.00046 (radians)
   (c) Peak 3: Amplitude = 10.57 ± 0.71 (units), Mean = 0.25180 ± 0.00018 (radians), Sigma = 0.00234 ± 0.00018 (radians), FWHM = 0.00550 ± 0.00043 (radians)
   (d) Peak 4: Amplitude = 11.53 ± 0.66 (units), Mean = 0.29569 ± 0.00015 (radians), Sigma = 0.00225 ± 0.00015 (radians), FWHM = 0.00530 ± 0.00035 (radians)
   (e) Peak 5: Amplitude = 4.51 ± 0.19 (units), Mean = 0.30900 ± 0.00015 (radians), Sigma = 0.00261 ± 0.00021 (radians), FWHM = 0.00616 ± 0.00049 (radians)

1. For sample2:
   (a) Peak 1: Amplitude = 10.77 ± 0.62 (units), Mean = 0.17746 ± 0.00012 (radians), Sigma = 0.00172 ± 0.00014 (radians), FWHM = 0.00404 ± 0.00034 (radians)
   (b) Peak 2: Amplitude = 3.20 ± 0.09 (units), Mean = 0.25186 ± 0.00017 (radians), Sigma = 0.00380 ± 0.00039 (radians), FWHM = 0.00895 ± 0.00092 (radians)
   (c) Peak 3: Amplitude = 3.34 ± 0.10 (units), Mean = 0.30942 ± 0.00014 (radians), Sigma = 0.00326 ± 0.00024 (radians), FWHM = 0.00768 ± 0.00056 (radians)

5 Discussion

6 Conclusion

References

[1] Philip Hofmann. *Solid State Physics: An Introduction*. Wiley-VCH, 2nd edition, 2015.