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Research Article

POWDER X-RAY DIFFRACTION PATTERN OF 4-AMINOPYRIDINE BASED COPPER (II) SULPHATE CRYSTALS

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Abstract

The 4-aminopyrine based copper (II) sulphate crystals were crystallised in triclinic crystal system with cell parameter a = 8.4311 Å, b = 7.4878 Å, c = 9.0807 Å, α = 116.6°, β = 138.1° and γ = 101°. From the powder x-ray data we confirm that the breadth decreases with increase in particle size (t) with mosaic defect.

Keywords

4-aminopyridine, powder x-ray diffraction, copper (II) sulphate, triclinic system.

1. Introduction

4-aminopyridine is a potassium channel-blocking agent, used as a bird repellent, and also it increases calcium influx at presynaptic terminals thereby enabling improvement of neuromuscular transmission in myelinated neurons [1-7]. Copper Sulphate is particularly useful in demanding applications, such as copper plating and electro less copper plating.

2 Materials and Methods

2.1 Preparation

Solutions of 4-aminopyridine and copper (II) sulphate in water (20 ml) each are mixed in molar ratio of one is to one. Blue colour crystals were obtained by slow evaporation after a period of three weeks.

2.2 Powder X-ray diffraction

Powder x-ray diffraction pattern were collected from diffracto-meter XPERT-PRO, with starting position 2θ = 10.0231°, end position 2θ = 80.9231°, step size 2θ = 0.0500°, specimen length = 10.00 mm, measurement temperature = 25°C, Cu as anode material and K_α = 1.54060 Å.

3. Result and Discussion

Powder x-ray diffraction data were used to investigate the crystal system and crystalline nature of the crystals. X-ray diffraction pattern of the 4-aminopyridine based copper II sulphate has been shown in figure 1. All the sharp peaks corresponding to the different scale particles confirms the crystalline nature of the compound. The pure complex were crystallised in triclinic crystal system with cell parameter 'a' = 8.4311 Å, 'b' = 7.4878 Å, 'c' = 9.0807 Å, α = 116.6°, β = 138.1° and γ = 101°. The powder x-ray diffraction pattern were indexed and tabulated in table 1.

Good crystal growth were identified in the direction of plane (-2 0 2) for the crystal which was grown in water environment. Figure 2 shows the fill width half maximum value for the one peak. The Scherrer formula is used to estimate the particle size of very small crystals. The calculated breadth B of 2θ ° due to small crystal effect alone of powder pattern line of particle is shown in table 2. From this table we could confirm that the Breadth decreases with increase in particle size (t) with mosaic defect.

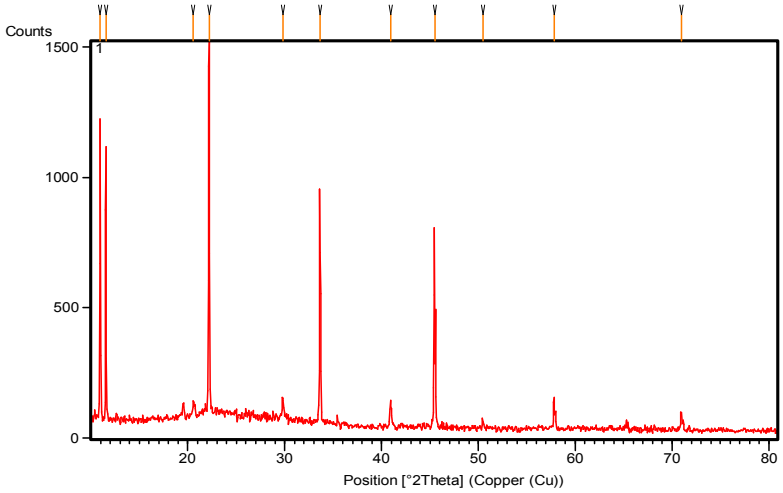

Figure 1 Powder x-ray diffraction pattern of the complex

Table 1 Indexing of powder x-ray diffraction pattern

Pos. [°2Th.]	Height [cts]	FWHM Left [°2Th.]	d-spacing [Å]	Rel. Int. [%]	h k l
10.9621	1205.72	0.1476	8.07121	76.39	1 0 0
11.5598	1142.60	0.1476	7.65523	72.40	0 0 1
29.8281	116.16	0.1968	3.99545	7.36	-2 0 2

Pos. [°2Th.]	Height [cts]	FWHM Left	d-spacing	Rel.	h k l

		[°2Th.]	[Å]	Int. [%]	
33.6672	699.99	0.1476	2.99314	44.35	0 -2 1
40.9564	89.61	0.1476	2.0561	5.68	3 0 0
45.4864	691.34	0.1968	1.99414	43.80	2 -3 0
50.4711	28.86	0.1476	1.80826	1.83	1 1 0
57.8141	122.91	0.2460	1.59486	7.79	0 2 0
70.9336	73.81	0.1476	1.32867	4.68	

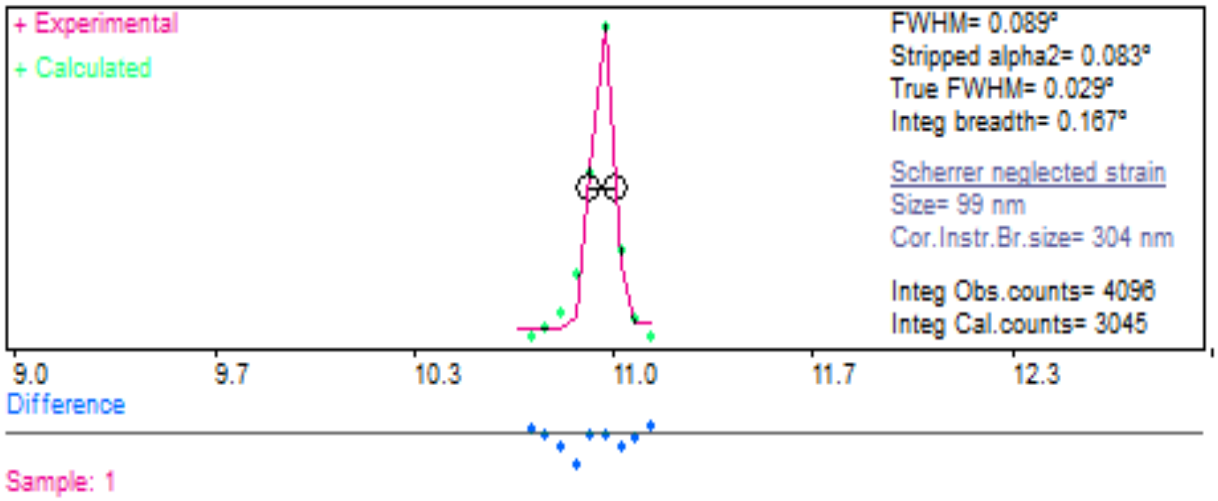

Figure 2 FWHM plot for one peak

Table 2: Calculated B and t values:

S.No	Calculated t Å	B ° = $\theta_1 - \theta_2$	Θ_B °
1	173.03	0.81	10.98
2	262.4	0.7	40.99
3	284.45	0.5266	22.24
4	350.83	0.7435	57.89

5	565.02	0.35	45.48

4. Conclusion

The 4-aminopyridine interact with copper II sulphate in water, and blue coloured crystals were harvested using slow evaporation method and the crystal system and the particle size of the as grown crystals were calculated using the powder X-ray diffraction pattern.

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