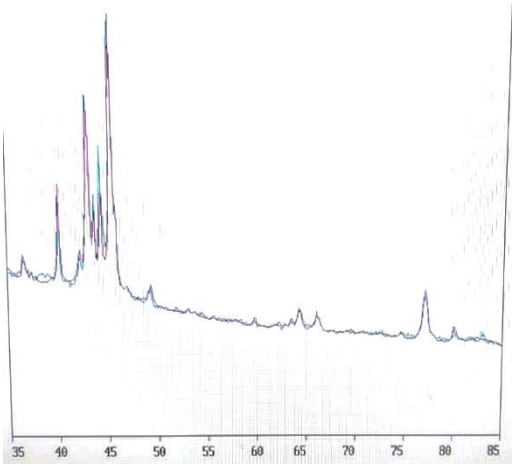
Al-Cu-Fe – Quasperiodic crystal (quasicrystalls)

# CERTIFICATE OF ANALYSIS: PHASE & COMPOSITION (XRD)

- QC-PSD-2025-07-14
- July 14, 2025

## 1. Sample Information

| Parameter | Value |
|---|---|
| Product Name: | Quasicrystalline Powder (Al-Cu-Fe) |
| Sample ID: | Al65Cu20Fe15 (Annealed 600°C) |




## 2. Analysis Results: Phase Composition

| Identified Phase | Volume fraction % | Weight fraction % |
|---|---|---|
| Al7 Fe Cu2 | 17.1 ± 0.1 | 16.2 ± 0.1 |
| Al65 Cu20 Fe15 - icosahedral | 98.9 ± 0.1 | 99.8 ± 0.2 |

## 3. Analysis Results: Chemical Composition

| # | Element | Specification (Atomic %) | Result (Atomic %) | Results (Weight %) |
|---|---|---|---|---|
| 1 | Aluminum (Al) | 62 - 65% | 65% | 45,41% |
| 2 | Copper (Cu) | 18 - 25% | 20% | 32,86% |
| 3 | Iron (Fe) | 12 - 18% | 15% | 31,73% |

## 4. XRD Spectrum

| | | |
|---|---|---|
| **1** | **- Phase Al7 Fe Cu2** | JCPDS 75-6473 tetr n.a. (HKL)+3 |
| 1.1. | A(*) | 6.33191±0.00055 eng. |
| 1.2. | C(*) | 14.80696±0.00209 eng. |
| 1.3. | Cauchy block diameter (*) | 421±28 eng. |
| 1.4. | The root-mean-square Gauss microdeformation (*) | 0.042±0.044 % |
| 2. | **- Phase Al65 Cu20 Fe15** | icosahedral JCPDS 49-1511 ortr n.a. (HKL)+0 |
| 2.1. | A(*) | 14.79243±0.00140 eng. |
| 2.2. | B(*) | 16.78163±0.00266 eng. |
| 2.3. | C(*) | 16.02473±0.00057 eng. |
| 2.4. | Cauchy block diameter (*) | 246±5 eng. |
| 2.5. | The root-mean-square Gauss microdeformation (*) | 0.083±0.007% |
| 3. | **- Phase Fe (type A2, at 1753 K)** | PSC cI2 /1 cube +T (HKL)+5 |
| 3.1. | A(*) | 2.93444±0.00021 eng. |
| 3.2. | Cauchy block diameter (*) | 433±51 eng. |
| 3.3. | The root-mean-square Gauss microdeformation (*) | 0.017±0.024% |

## 5. Methodology & Equipment

| # | Parameter | Description |
|---|---|---|
| 1 | Analysis Method: | X-Ray Diffraction (XRD), Full-profile analysis |
| 2 | Radiation: | Cu (Wavelength 1.54178 Å) |
| 3 | Shooting interval and step by 2*TETA (hail.) | 35.000-85.000; 0.100 |
| 4 | Number of shooting points | 501 |
| 5 | Exposure per shooting point (sec.) | 5.0 |
| 6 | Maximum / Minimum of the spectrum (imp.) | 23 057 / 5 090 |
| 7 | The minimum of the quadratic form is | 8 231 |
| 8 | The minimum value when the model is adequate | 1 475 ± 109 |
| 9 | Weights of survey points | 1 - 7 |

info@al-cu-fe.com https://al-cu-fe.com +99 890 823 82 35
«IT2BSNS» LLC Toshkent Shahar, Yashnobod tumani, Qadriyat MFY, Alimkent kochasi, 1-tor ko chasi, 32/2 uy