Technical Data Sheet (TDS)

Product Name: XT 60% Copper on Ketjenblack EC300J Grade T
Fuel Cell Store SKU Numbers: 11080092, 11080093, 11080094
Form: Fine powder
Application: Catalyst for electrochemical applications and other R&D use cases

1. General Information

Parameter	Specification
Appearance	Fine, porous black powder
Composition (wt%)	~ 60 wt% Cu, ~40 wt% Carbon support
Support	Ketjenblack EC300J
Molecular Formula	Not applicable (heterogeneous composite)
Metal Purity	≥ 99.9 % (Cu metal basis)
Storage	Store in a tightly sealed, antistatic container under dry conditions at room temperature.

2. Physical Properties

Property	Value
Particle Morphology	Nanocrystalline Cu clusters uniformly dispersed on high-surface-area carbon
Average Particle Size	31 µm (D_{50}, Laser Diffraction)
Particle Size Range	µm (D_{10} – D_{90})
BET Surface Area	In the range of 290 - 330 m^2/g
Bulk Density(loose Powder)	~0.32 - 0.48 g/cm^3
Color	Black

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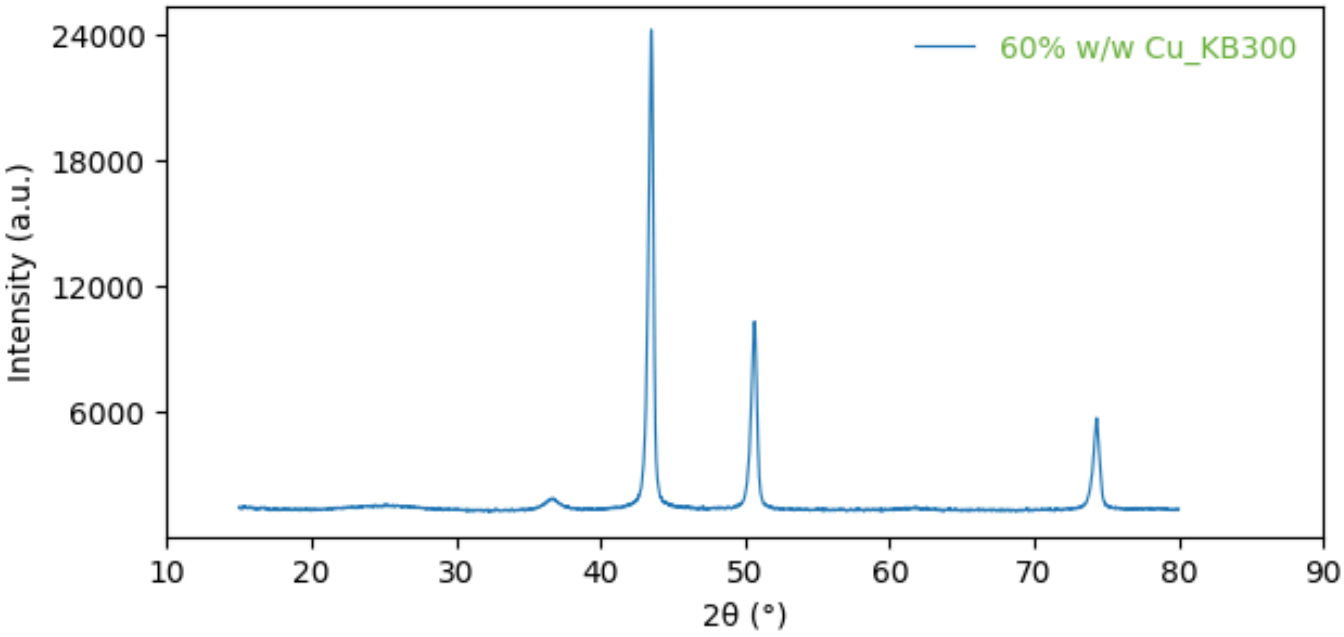
3. Structural Characterization (X-ray Diffraction)

Phase Identified:

- **Structure** : Face-centered cubic (fcc) Copper (0)
- **Database Reference:** COD Card No. (7101264); JCPDS No. (04-0783)
- **Space Group** : *Fm-3m*
- **Secondary Phases** : None detected

- **Instrument:** Rigaku MiniFlex 300/600
- **Cu-Kα radiation** (λ = 1.5406 Å **|** **scan rate:** 0.5°/min **|** **step size:** 0.02°(2θ),
- **2θ range:** 10–90° **|** **optics:** Monochromator



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Selected Diffraction Peaks:

hkl Plane	2θ (°)	d-spacing (Å)	FWHM (°)	Crystallite Size (nm)	Relative Intensity (%)
(111)	43.52	2.077	0.37	24.2	100.0
(200)	50.65	1.801	0.41	22.4	44.62
(220)	74.32	1.275	0.43	24.6	23.74

Lattice Parameters:

Parameter	Value (Å/°)
a = b=c	3.6018 Å
α, β, γ	90°

Bond Distances:

- Cu-Cu nearest-neighbor distance: 3.0138 Å
- Consistent with FCC 12-fold cubic coordination.

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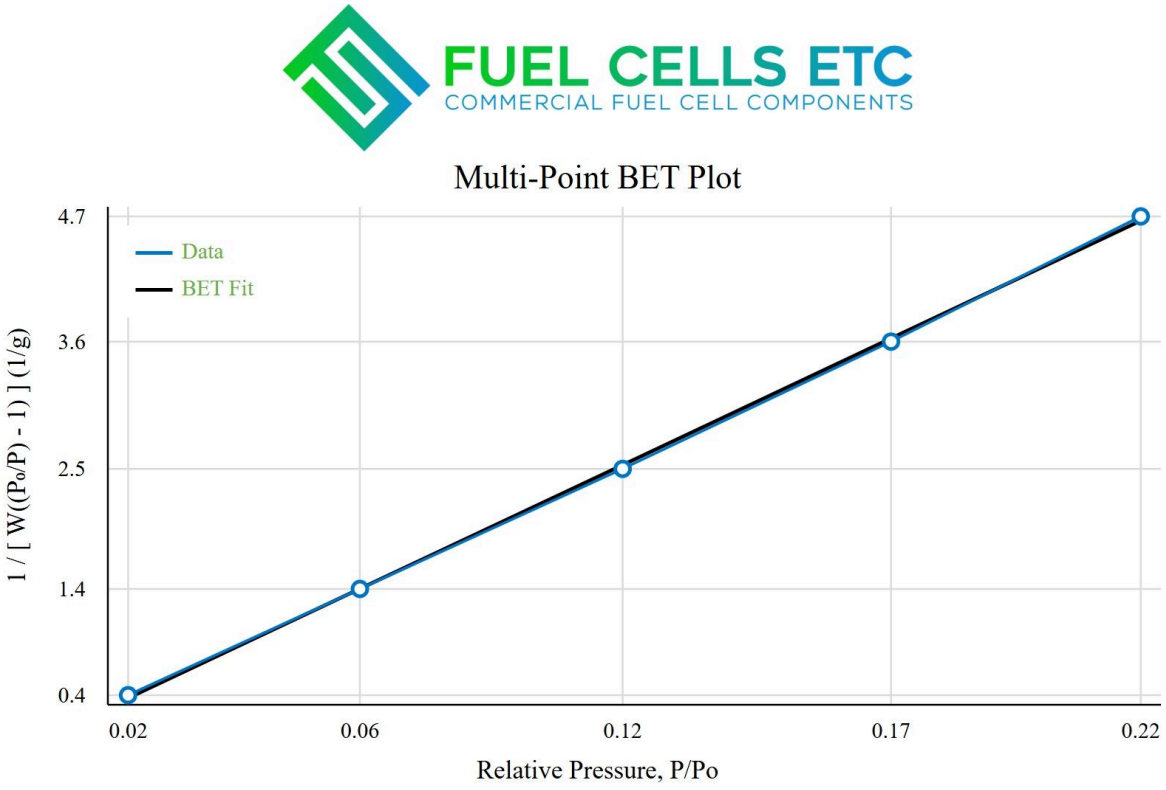
4. Surface Area Analysis (BET)

Instrument: Anton Paar QuantaChrome NOVA

Adsorption gas: N_2, Bath temperature: 77.3 K

- Degassing Conditions: **4 hrs, 100°C**
  Sample Weight: **0.3002 g**
  Sample Volume: **0.07697 cc**
  Equilibration Time: **60 sec (adsorption/desorption)**
  Relative Pressure Range (P/Po): **~0.02 – 0.3**
  Analysis Time: **156.8 minutes**



BET Results Summary:

BET surface area for this particular production batch: **326.882 m²/g,**
C constant: 140.078,
slope: 10.578 (1/g),
intercept: 0.076 (1/g),
correlation coefficient (r^2): 0.9999

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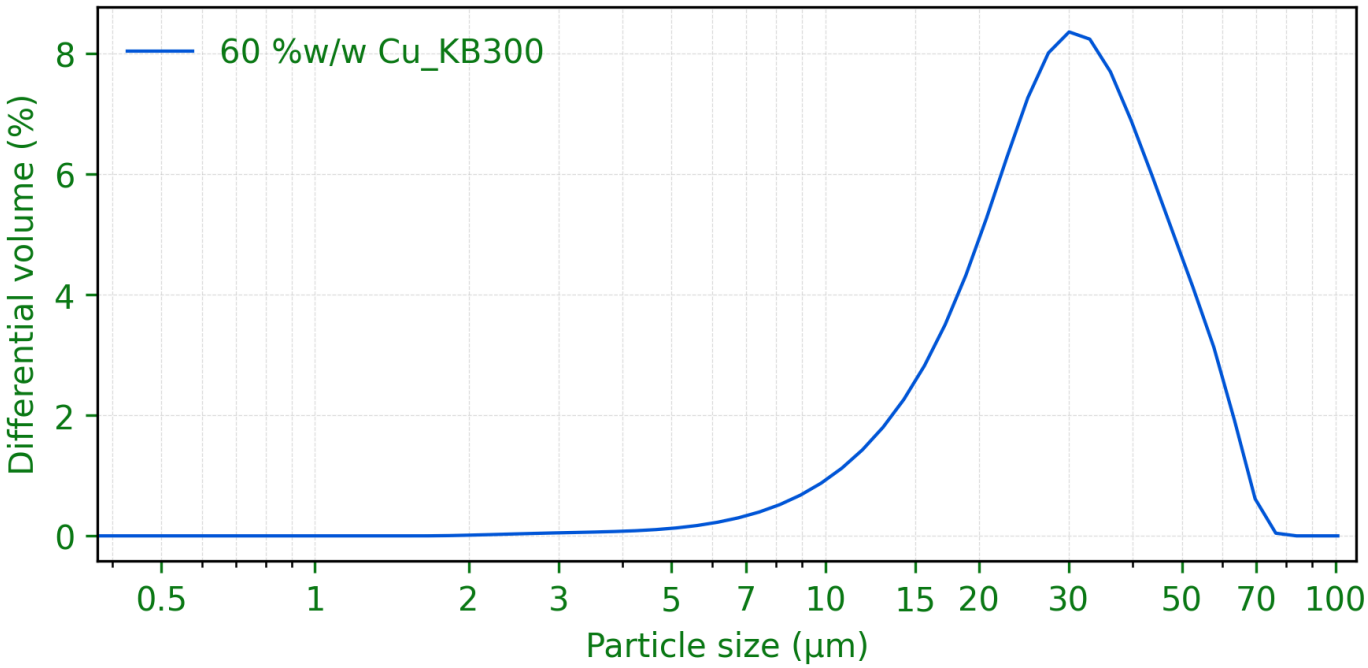
5. Particle Size Distribution (Laser Diffraction):

Instrument: Beckman Coulter LS 13 320 | **Fluid:** Water
Measurement Type: Average of 3 runs



Percentile Values:

- D_{10}: **15.37 µm**
- D_{25}: **22.21 µm**
- D_{50}: **(Median): 30.79 µm**
- D_{75}: **41.33 µm**
- D_{90}: **52.46 µm**

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6. Handling and Safety

- **PPE:** nitrile gloves, P-100/N95 particulate respirator, chemical splash safety goggles, lab coat.
- **Exposure:** avoid inhalation of fine particulate matter and prevent skin/eye contact. Copper-containing carbon powders may cause mechanical irritation and prolonged exposure may contribute to metal sensitisation.
- **Ventilation:** handle inside a certified chemical fume hood or well-ventilated enclosure to minimise airborne particulate dispersion and nanoparticle exposure.
- **Combustion risk:** carbon support is combustible and finely divided Cu/C powders may present dust ignition risk. Keep away from strong oxidising agents, sparks, electrostatic discharge, and open flames. Avoid dust accumulation.
- **Chemical incompatibility:** avoid contact with strong acids, oxidisers, halogens, and peroxide-forming reagents which may accelerate copper oxidation or carbon degradation.
- **Disposal:** dispose according to local environmental and hazardous waste regulations. Recover and recycle copper content whenever feasible to minimise heavy-metal waste generation.

Oxidation sensitivity: Copper on carbon is susceptible to gradual surface oxidation under ambient atmospheric conditions, especially in the presence of moisture, oxygen, and elevated temperature. Oxidation may alter catalytic activity, conductivity, and surface chemistry. Store under inert atmosphere or tightly sealed low-humidity conditions when possible.

Storage stability observation: Slight surface oxidation of the copper phase was experimentally observed after ~4 weeks of ambient atmospheric storage, indicating gradual oxidation susceptibility under prolonged air exposure.

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