



Technical Data Sheet (TDS)

Product Name: Ruthenium Black, ~70-100 m²/gram BET surface area

Fuel Cell Store SKU Number: 11080074, 11080075, 11080076

Form: Fine powder

Application: Catalyst powder for electrochemical device and other R&D use cases

1. General Information

Parameter	Specification
Appearance	Dark gray to black metallic powder
Molecular Formula	Ru
Molecular Weight	101.07 g/mol
Purity	> 99.9% (3N)
Storage	Store in an airtight container at room temperature in dry conditions

2. Physical Properties

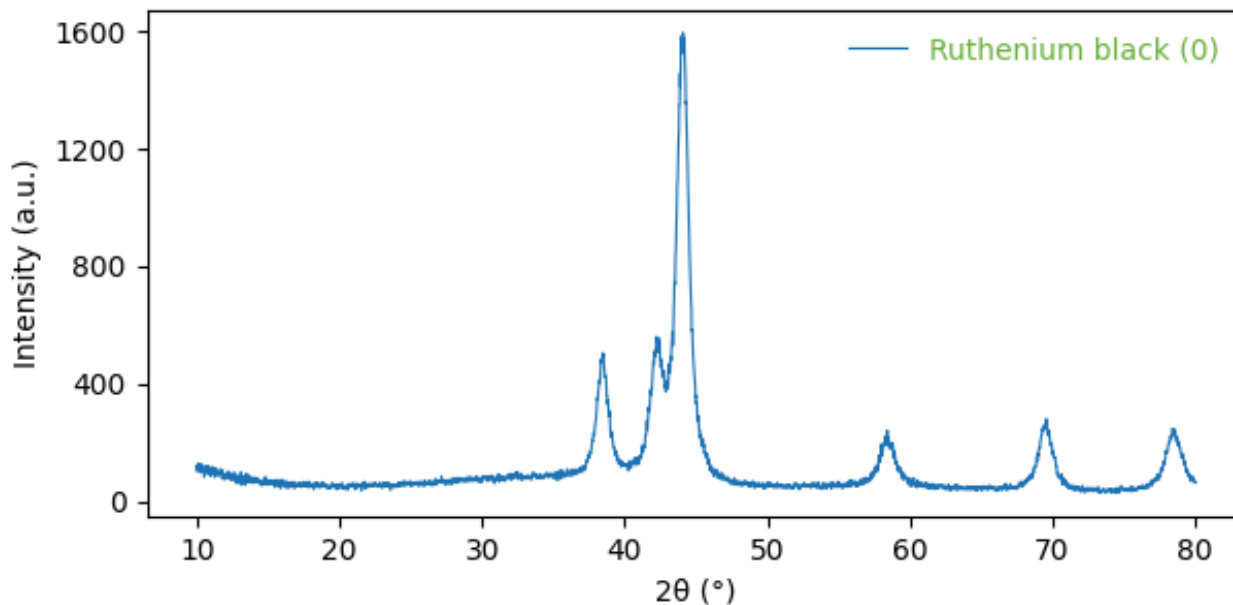
Property	Value
Particle Morphology	Irregular/rough-metallic grains
Average Particle Size	µm (D ₅₀ , Laser Diffraction)
Particle Size Range	22.73 µm (D ₁₀ – D ₉₀)
BET Surface Area	75 - 100 m ² /g
Bulk Density	~ 2.5-4 g/cm ³
Color	Grey-black metallic

3. Structural Characterization (X-ray Diffraction)

Phase Identified:

- **Phase:** Hexagonal close-packed Ru metal
 - **Database Reference:** COD Card No. (8104268); JCPDS No. (006-0663)
 - **Space Group:** $P6_3/mmc$
 - **Secondary Phases:** None detected
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- **Instrument:** Rigaku MiniFlex 300/600
- **Cu-K α radiation** ($\lambda = 1.5406 \text{ \AA}$ | **scan rate:** $0.5^\circ/\text{min}$ | **step size:** $0.02^\circ(2\theta)$,
- **2θ range:** $10\text{--}80^\circ$ | **optics:** Monochromator





CATALYST

Selected Diffraction Peaks:

hkl Plane	2θ (°)	d-spacing (Å)	FWHM (°)	Crystallite Size (nm)	Relative Intensity (%)
(100)	38.42	2.341	0.94	9.31	25.27
(002)	42.23	2.138	1.05	8.5	28.96
(101)	44.04	2.054	0.96	9.25	100
(102)	58.33	1.581	1.23	7.7	14.3
(110)	69.22	1.356	1.22	8.26	11.85
(103)	78.38	1.219	1.42	7.56	25.45

Lattice Parameters:

Parameter	Value (Å/°)
a = b	2.7065 Å
c	4.2775 Å
α, β, γ	90°, 90°, 120°

Bond Distances:

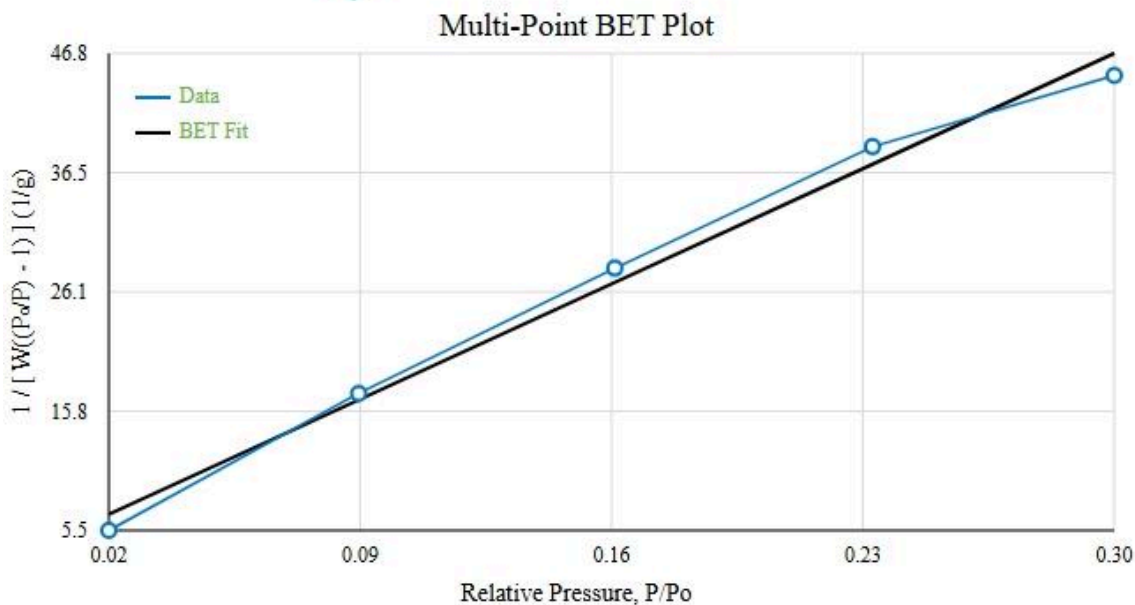
- Ru–Ru nearest neighbor distance ~ **2.64882 Å**
- Consistent with the expected value for (hcp) metallic ruthenium (12-fold coordinated).

4. Surface Area Analysis (BET)

Instrument: Anton Paar QuantaChrome NOVA

Adsorption gas: N₂, Bath temperature: 77.3 K

- Degassing Conditions: **4 hrs, 100°C**
Sample Weight: **0.2928 g**
Sample Volume: **0.07508 cc**
Equilibration Time: **60 sec (adsorption/desorption)**
Relative Pressure Range (P/P₀): **~0.02 – 0.3**
Analysis Time: **67.5 minutes**



BET Results Summary:

BET surface area for this particular production batch: **74.48 m²/g**,

C constant: **66.655**

slope: **46.057 (1/g)**,

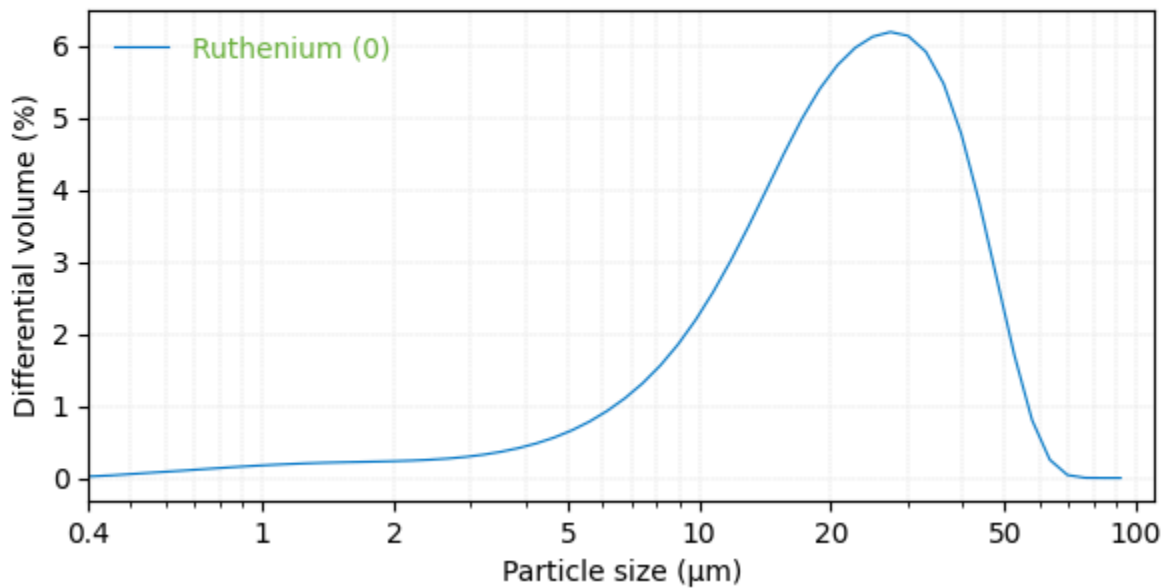
intercept: **0.715 (1/g)**,

correlation coefficient (r²): **0.999**

5. Particle Size Distribution (Laser Diffraction):

Instrument: Beckman Coulter LS 13 320 | **Fluid:** Water

Measurement Type: Average of 3 runs



Percentile Values:

- **D₁₀: 7.79 µm**
- **D₂₅: 14.13 µm**
- **D₅₀ (Median): 22.73 µm**
- **D₇₅: 33.33 µm**
- **D₉₀: 43.20 µm**

The technical information provided in this document originates from the Ru black with manufacturer's lot number of 69449-01.

6. Handling and Safety

- Use appropriate PPE: gloves, dust mask, goggles
- Avoid inhalation or contact with skin and eyes; fine Ru metal powder is an irritant and may cause respiratory sensitization with prolonged exposure.
- Avoid strong oxidizers; finely divided noble-metal powders can catalyze exothermic reactions.
- Dispose of material according to local regulations