

## Technical Data Sheet (TDS)

**Product Name:** XT 20% Nickel on Vulcan XC72R Grade S

**Fuel Cell Store SKU Numbers:** 11080023 and 11080024

**Form:** Fine powder

**Application areas:** As an electrocatalyst in electrochemical devices and as a heterogeneous catalyst for the synthesis of various organic compounds.

### 1. General Information

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Parameter	Specification
Appearance	Fine, porous black powder
Composition	20 wt % Ni, 80 wt % Vulcan carbon (XC72R)
Molecular Weight	Not applicable (heterogeneous composite)
Purity	> 99.9% (3N)
Storage	Store in a tightly sealed, antistatic container under dry conditions at room temperature. Air-sensitive nanopowders can be stored under dry and inert atmosphere conditions in order to prevent or minimize their surface oxidation.

### 2. Physical Properties

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Property	Value
Particle Morphology	Aggregated clusters of primary Ni nanoparticles (supported on high surface area carbon black)
Average Particle Size	38.44 $\mu\text{m}$ ( $D_{50}$ , Laser Diffraction)
Particle Size Range	$\mu\text{m}$ ( $D_{10}$ – $D_{90}$ )
BET Surface Area	180 – 200 $\text{m}^2 \text{g}^{-1}$
Bulk Density	~0.35 – 0.45 $\text{g cm}^{-3}$
Color	Black

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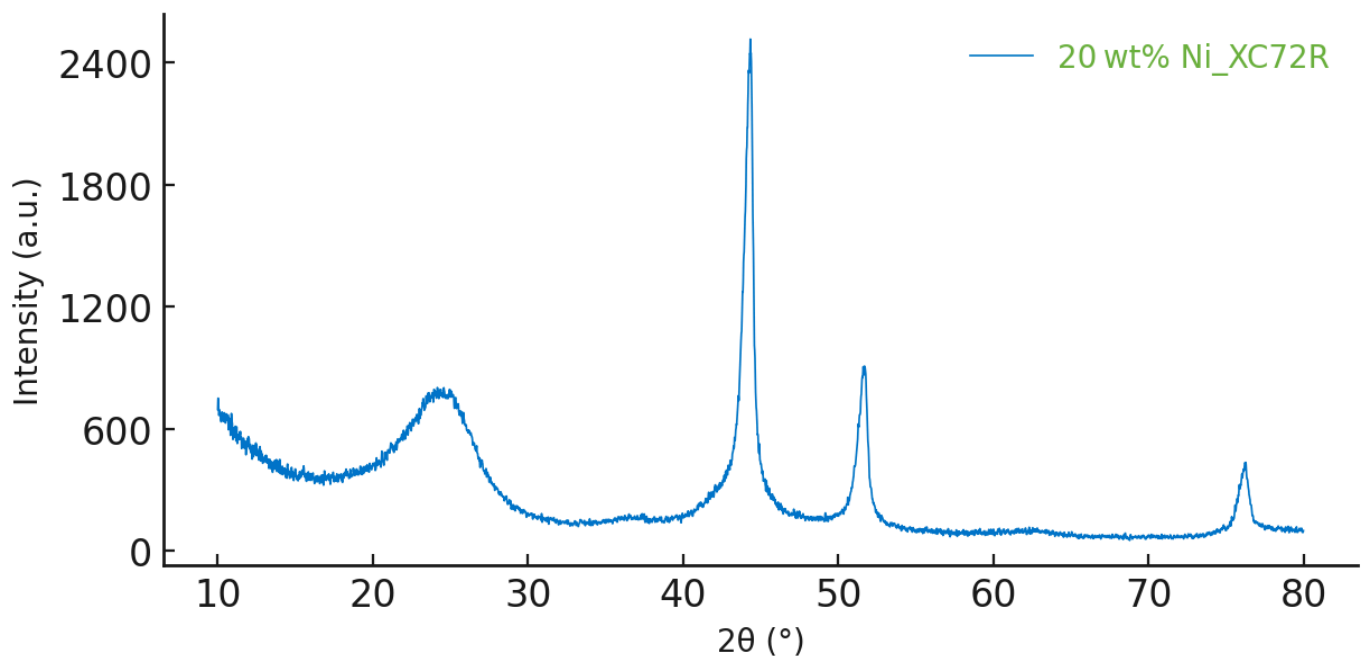
### 3. Structural Characterization (X-ray Diffraction)

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#### Phase Identified:

- **Structure** : Face-centered cubic (fcc) Nickel
  - **Database Reference:** COD Card No. (2102302); JCPDS No. (04-0850)
  - **Space Group** : Fm-3m
  - **Secondary Phases** : None detected (only amorphous carbon support)
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- **Instrument:** Rigaku MiniFlex 300/600
- **Cu-K $\alpha$  radiation** ( $\lambda = 1.5406 \text{ \AA}$  | **scan rate:** 0.5°/min | **step size:** 0.02°(2 $\theta$ ),
- **2 $\theta$  range:** 10–80° | **optics:** Monochromator



**Selected Diffraction Peaks:**

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hkl Plane	2 $\theta$ (°)	d-spacing (Å)	FWHM (°)	Crystallite Size (nm)	Relative Intensity (%)
(111)	44.31	2.043	0.64	14	100
(200)	51.68	1.767	0.70	13.1	42.1
(220)	76.17	1.249	0.74	14.3	15.9

**Lattice Parameters:**

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Parameter	Value (Å/°)
a = b = c	3.5355 Å
$\alpha, \beta, \gamma$	90°, 90°, 90°

**Bond Distances:**

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- Ni-Ni nearest neighbour distances range: **2.49 Å**
- Consistent with fcc 12-fold cubic coordination.

## 4. Surface Area Analysis (BET)

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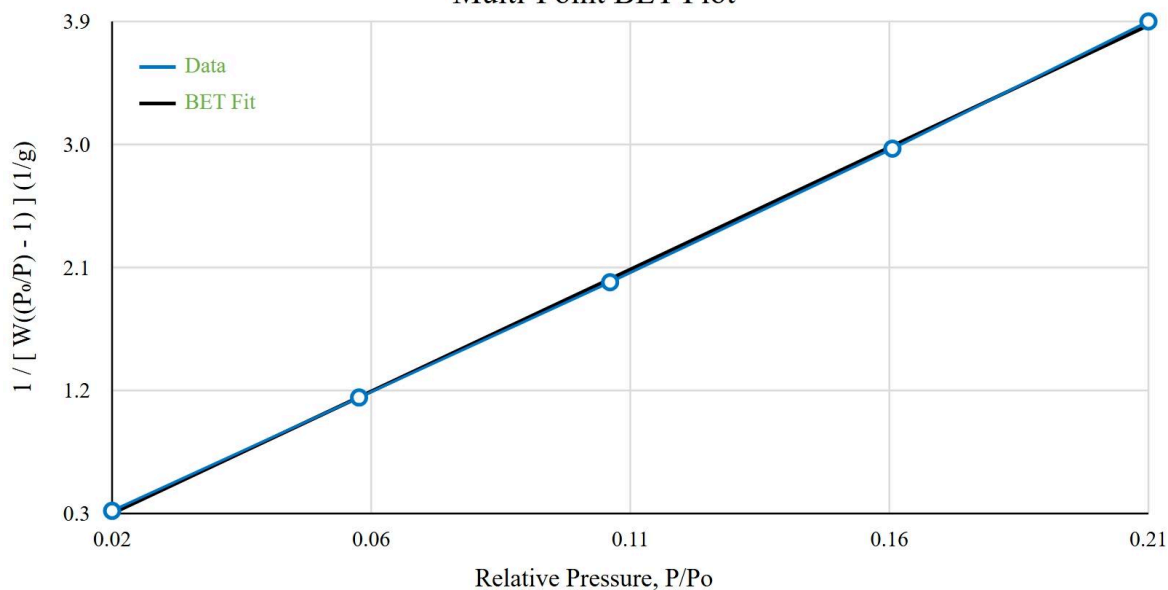
**Instrument: Anton Paar QuantaChrome NOVA**

**Adsorption gas: N<sub>2</sub>, Bath temperature: 77.3 K**

- **Degassing Conditions: 4 hrs, 100°C**  
Sample Weight: **0.203 g**  
Sample Volume: **0.05205 cc**  
Equilibration Time: **60 sec (adsorption/desorption)**  
Relative Pressure Range (P/P<sub>0</sub>): **~0.017 – 0.21**  
Analysis Time: **88.3 minutes**



Multi-Point BET Plot



### BET Results Summary:

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**BET surface area** for this particular production batch: **184.520 m<sup>2</sup>/g**,  
**C constant:** 2120.916,  
**slope:** 18.864 (1/g),  
**intercept:** 0.00889 (1/g),  
**correlation coefficient (r<sup>2</sup>):** 0.9998

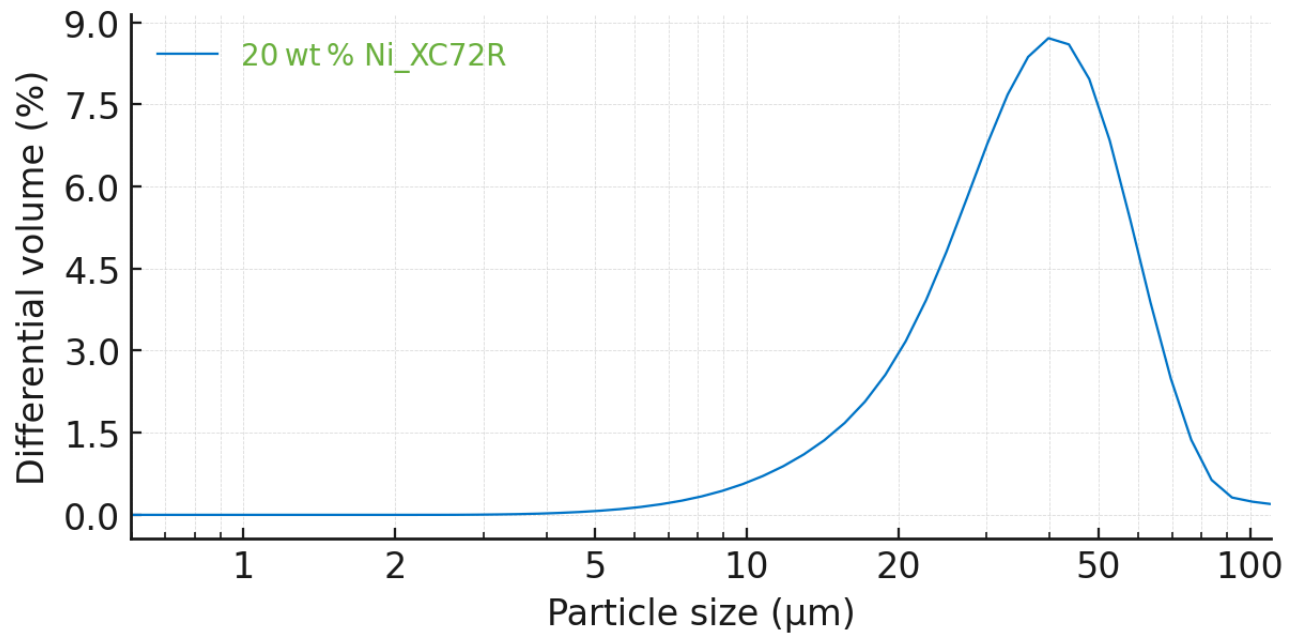
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## 5. Particle Size Distribution (Laser Diffraction):

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

**Measurement Type:** Average of 3 runs



### Percentile Values:

- **D<sub>10</sub>: 18.81 µm**
  - **D<sub>25</sub>: 27.6 µm**
  - **D<sub>50</sub>: (Median): 38.441 µm**
  - **D<sub>75</sub>: 50.60 µm**
  - **D<sub>90</sub>: 62.71 µm**
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## 6. Handling and Safety

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- **PPE:** nitrile gloves, P-100/N95 mask, safety goggles; handle in a fume hood.
- **Health hazard:** Ni dust can irritate lungs and skin and is classified as a suspected human carcinogen—avoid inhalation and prolonged contact.
- **Combustion risk:** carbon support is combustible; keep away from flames and static, and ground equipment during transfer.
- **Storage:** sealed, antistatic container in a dry, inert atmosphere.
- **Spills & disposal:** damp-wipe or use a HEPA vacuum; recover Ni for recycling when possible or discard as hazardous waste per local regulations.