

March 19, 2021

**DANISH
TECHNOLOGICAL
INSTITUTE**

Product Report



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March 19, 2021

Product: Cu nanopaste DTI-Cu-CH

Batch: DTI-Cu-CH259

Description: Copper nanoparticles in propylene glycol

Tests: PXRD, SEM, DLS

Storage: Store material at room temperature and avoid direct light exposure. After use, dispose of remaining materials at local waste handling facility. Do NOT release material to aqueous environments.

Conditions: The work has been performed according to the general terms and conditions of The Danish Technological Institute. The test results are solely referring to the tested (examined) materials.
Publication of extracts from the product report is allowed, if the testing laboratory has given a written approval.

Place: Danish Technological Institute, Taastrup,
Nano Production and Micro Analysis

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Tests

- A X-ray diffractometer (XRD) equipped with a Cu X-ray source (K_{α} wavelength 1.5406 Å). This instrument allows the crystalline phases in the powder samples to be analyzed (identification and relative quantification of phases).
- Scanning electron microscope (SEM) equipped with X-ray microanalysis facilities (EDX). This allows microstructure and element composition to be analyzed.
- A Malvern Zetasizer Nano ZS was utilized to measure Dynamic Light Scattering (DLS) on a water-diluted sample.

Test results

Table: average results

BATCH NAME	DTI-CU-CH259
SEM SIZES	50-300 nm
PXRD AVERAGE CRYSTALLITE SIZES	24 nm
DLS Z-AVERAGE	178,5 nm

Documentation

Figure: SEM

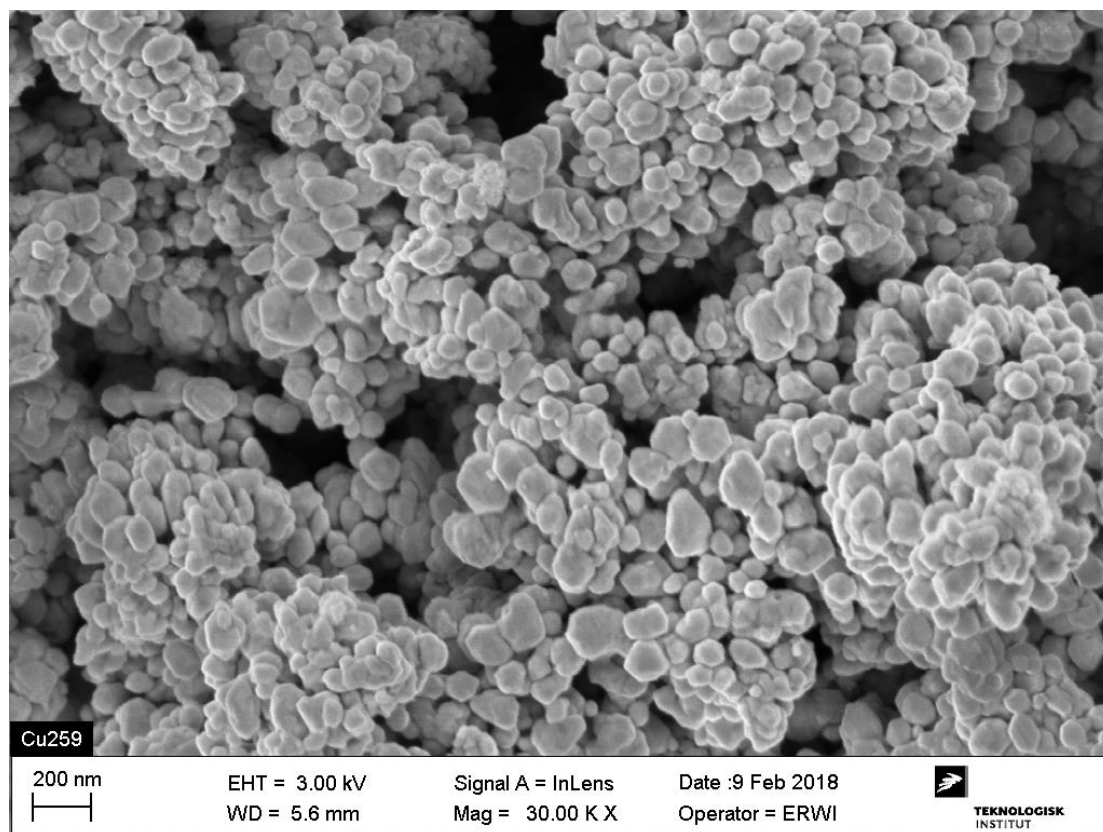


Figure: PXRD

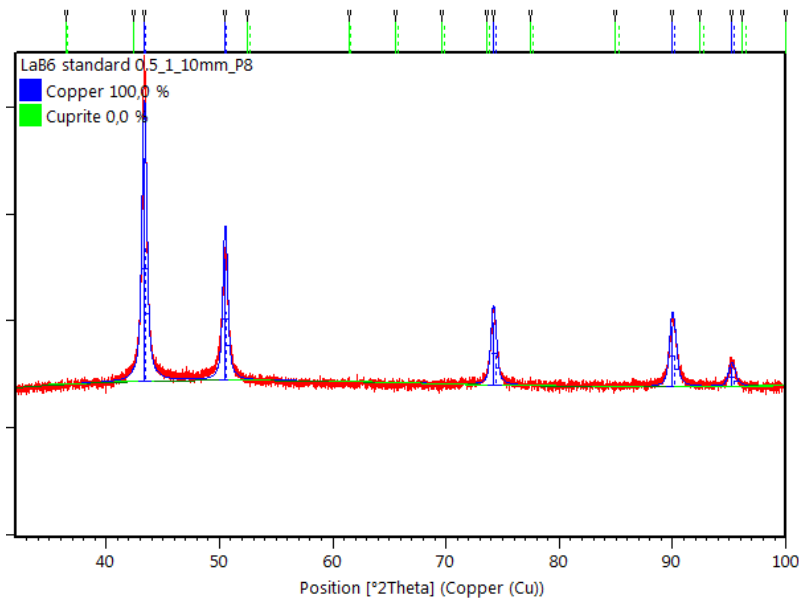


Figure: DLS

Sample Name: MASO Cu259-US1min 1
 SOP Name: Cu in water.sop
 File Name: nano-inks.dts
 Record Number: 931
 Material RI: 0,25
 Material Absorbion: 1,000

Dispersant Name: Water
 Dispersant RI: 1,330
 Viscosity (cP): 0,8872
 Measurement Date and Time: 12. februar 2018 12:59:03

Temperature (°C): 25,0
 Count Rate (kcps): 269,3
 Cell Description: Disposable sizing cuvette

Duration Used (s): 60
 Measurement Position (mm): 1,25
 Attenuator: 5

	Size (d.nm):	% Intensity:	St Dev (d.nm):
Z-Average (d.nm): 178,5	Peak 1: 193,4	96,8	78,39
PdI: 0,294	Peak 2: 5176	3,2	487,7
Intercept: 0,838	Peak 3: 0,000	0,0	0,000

Result quality : **Good**

