Characterization results for the copper nanoparticle sample using AFM

PARTICLE CHARACTERIZATION REPORT

Characteristics of the submitted samples:
Analysis date: August 24, 2024
Samples: Submitted with document 01-572-111
Requested by: Comercializadora de Alimentos Saludables Limitada
Description: Copper-colored powder resuspended in isopropanol.

Sample preparation:
Sample homogenized by ultrasonication for 15 minutes.

1. Scanning Electron Microscopy
Image acquisition was performed using a High-Resolution Scanning Electron Microscope (HR-SEM), INSPECT-F50, FEI. The STEM transmission electron detector was used, with an electron acceleration voltage of 10 kV.

Morphology analysis
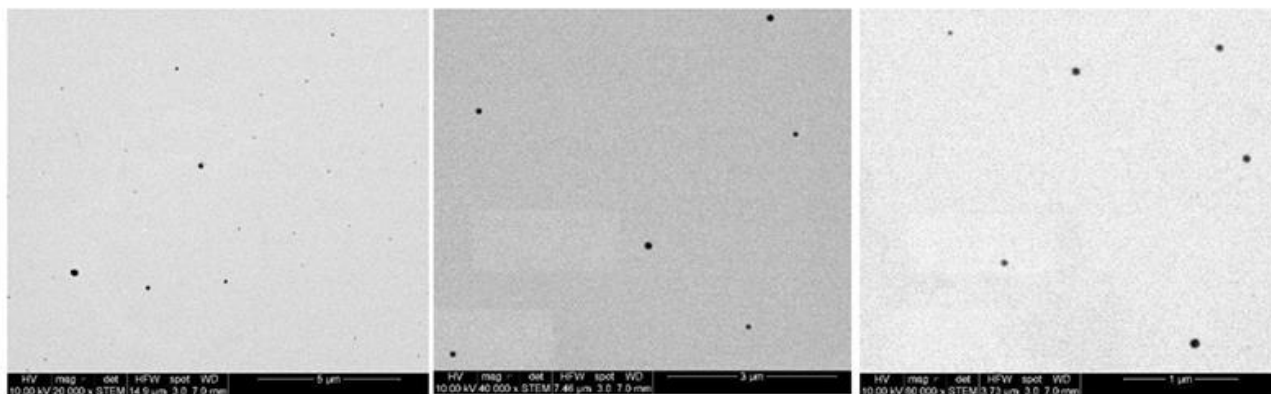Particles with spheroidal morphology (Figure 1).

Figura 1. Micrografías representativas de la muestra, obtenidas por FE-SEM con el detector STEM (Transmision). Barra equivale a una escala de 5 µM, 3 µM y 1 µM.

Traducción al inglés (solo texto; sin el gráfico)

Size distribution:

To obtain the size-distribution histogram, 151 particles were measured. Based on the histogram (Figure 2), it was determined that this particle population fits a Gaussian curve, with the best fit being a 4-parameter curve with $r^2 = 0.9400$. The peak is 49.7 ± 1.1 nm. From the results of this fit, it can be confirmed with 95% confidence that 50% of the particles have a size between 43–73 nm (Table 1). Based on this statistical analysis, it can be concluded that the sample distribution shows low dispersion, which is confirmed by the obtained average: 64, with a standard deviation of ± 31 nm.

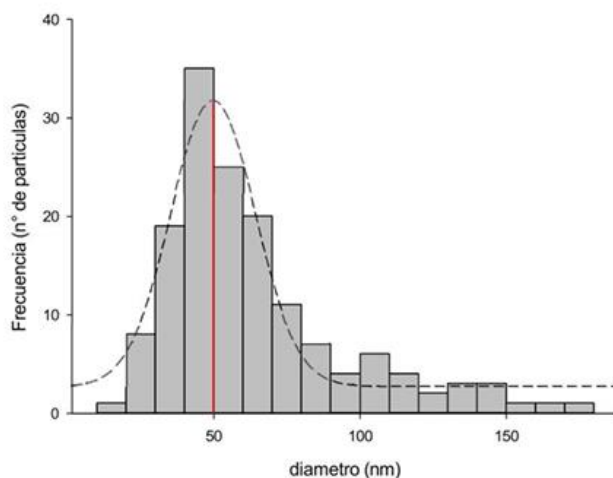| Tamaño (nm)	Número de partículas	% de partículas
0-30	9	6
30-60	*79*	*52*
60-90	38	25
90-120	14	9
120-150	8	5
150-180	3	2
Total	**151**	**100**

Figura 2. Histograma de distribución de tamaño de 151 partículas. Línea negra segmentada describe el mejor ajuste. Línea roja indica el *peak* del ajuste de la curva en 49,7 nm.

Tabla 1. Rango de diámetro de las partículas y porcentajes de distribución. En rojo se marcan los rangos de tamaño que tienen un mayor porcentaje de la población.

2. Results summary

The physicochemical characterization of the sample was performed by electron microscopy. The analysis results are summarized in Table 2:

Table 2. Results summary

Tamaño (STEM)	49,7 ± 1,1 nm

The images and data files used to prepare this report are provided as attachments. For image analysis and particle size recording, ImageJ software version 1.5 was used. For plotting and performing the statistical analysis, SigmaPlot software version 12 was used.

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