HORIBA Scientific

Application Note

High Repeatability PSD of Colloidal Silica

AN236

High Repeatability Particle Size Distribution Measurement of Colloidal Silica for CMP slurries

Introduction

Chemical Mechanical Polishing (CMP) technology is used as an essential fundamental technology in the manufacturing process of large scale semiconductor integrated circuits (LSI). Colloidal silica are widely used as CMP slurries because of their clean spherical shape created by the sol-gel method, which causes less polishing damage.

Since it is used for very precise polishing, its particle size is controlled with extremely high quality, and the particle size analyzer used for it must have high resolution and measurement repeatability. Colloidal silica was measured by Partica CENTRIFUGE, a centrifugal nanoparticle analyzer, and its measurement repeatability was confirmed.

Measurement Condition

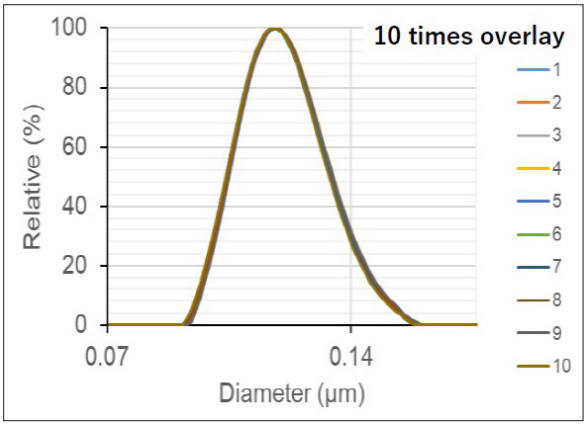
Sample	Colloidal silica dispersion (Density: 1980kg/m^3, RI: 1.45-0.00i) Concentration 3.5%, diluted to ABS≈1
Dispersant	Water (Density: 996 kg/m^3, RI: 1.333)
Method	Homogeneous • Sample volume: 1500 µL
PSD Basis	Volume
Calculation Setting	QC

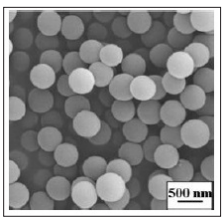
Measurement Results

Number of measurements	10
Average size	112.7 nm
Standard deviation	0.5 nm
CV	0.4%

Each Measurement Results

	Average size [µm]		Average size [µm]
#1	0.1125	**#6**	0.1131
#2	0.1131	**#7**	0.1123
#3	0.1123	**#8**	0.1130
#4	0.1129	**#9**	0.1135
#5	0.1125	**#10**	0.1119
		10 times average	**0.1127**
		CV	**0.4 %**





Colloidal silica
Examples of SEM images
Materials and Design
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Conclusion

As a result of the measurement, a particle size distribution (PSD) with a narrow distribution width and a peak around 100 nm was obtained.

In addition, as a result of 10 measurements with different sampling, we obtained a mean diameter of 112.7 nm, a standard deviation of 0.5 nm, and a CV value of 0.4%, which is an extremely high repeatability result. In addition, the shape of the particle size distribution, such as the distribution width, was also measured with high repeatability.

In this way, Partica CENTRIFUGE can easily perform measurement with high resolution and repeatability, which contributes to research and development and quality control of CMP slurry.

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