Particle Size of Certified Standards using Time-Of-Transition Method

Introduction

Particle Size Analysis using the TOT principle

The CIS-100 systems are based on well-founded principles of the Time Of Transition (TOT) theory. A sample containing moving or stationary particles is scanned with a focussed He-Ne laser beam, rotating with a constant frequency by a wedge prism.

Since the angular velocity is known, the size of each individual particle can be calculated from the duration and form of the beam obscuration signal. The time of obscuration (Time-Of-Transition) is directly related to the particle diameter:

$$D = v \times t$$

Where:

D = Particle diameter

v = Trajectory velocity of the laser

t = Time of Transition

Accurately and reliable, with reproducible results, the TOT method refers directly to particle size rather than to secondary properties. This eliminates inconsistencies due to refractive index, viscosity variations, Brownian motion, thermal convection and other physical phenomena.

Since the TOT measurement is a time domain measurement rather than a signal intensity measurement, the system does not need to be calibrated at any time.

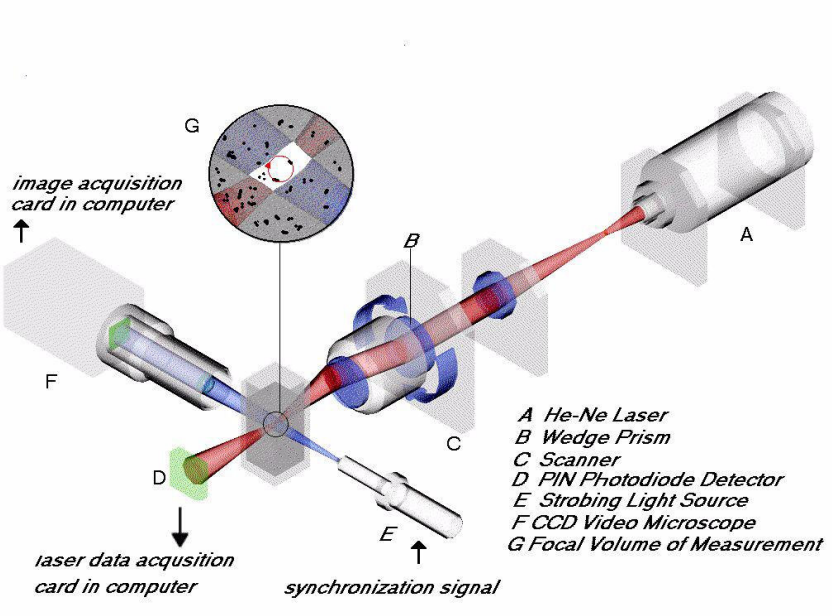

Figure 1 – Schematic view of the Laser channel

Summary

10 repetitive measurements of Latex standards of 20 and 115 microns were performed with Galai CIS-100 to indicate the repeatability and correctness of particle size analysis based on the Time-Of-Transition principle.

Measurement set-up

CIS-100		
Lens	:	A100
Sample Cell	:	GCM 104A
Sample Introduction	:	LFC 101
Acquisition range	:	0 – 150 microns
Sample Type	:	Regular

Duke scientific certified latex standards

Latex 20	: Mean Particle Size: 20 ± 0,2 microns
Latex 115	: Mean Particle Size: 114 ± 2 microns

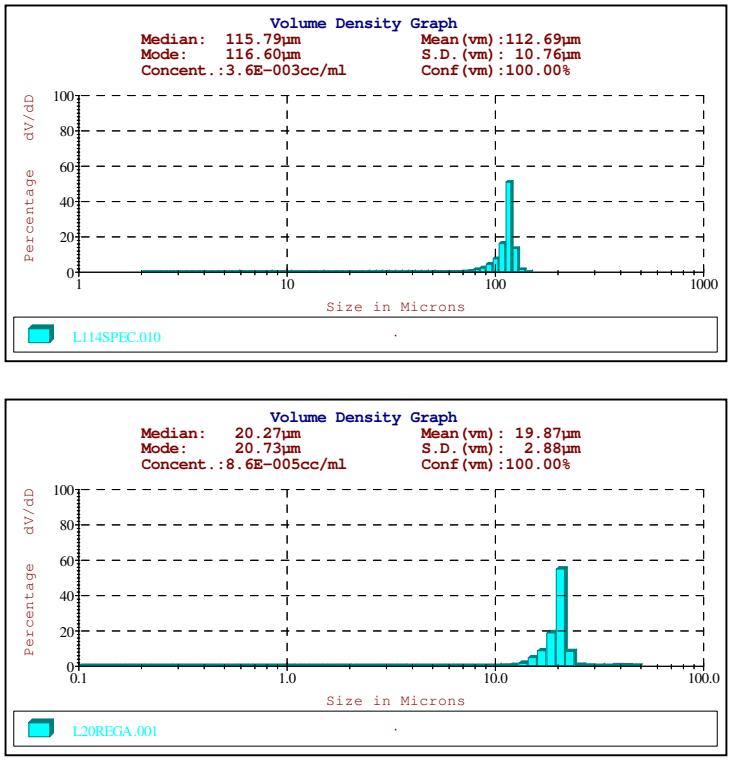

Figure 2 – Particle Size Distributions of Latex 20 and Latex 114

Table 1: Mean Particle Size Diameter of Latex 20 & Latex 115

	Latex 20	Latex 114
	19,61	112,67
	19,73	112,48
	19,67	113,07
	19,66	112,65
	19,67	112,44
	19,64	112,72
	19,66	112,31
	19,68	112,53
	19,88	112,67
	19,87	112,69
Average	19,71	112,62
Std	0,094	0,205
RSD	0,47	0,18

Conclusion

Particle Size measurements based on the TOT principle yield correct, repeatable results for the mean particle size of latex standards without the necessity of calibration.

References

1. Aharonson; Karasikov, N.; *J. Aerosol Science, **1986**,* 17, 530-536

2. Karasikov, N.; Krauss, M.; Barazani, G., In *Particle Size Analysis,* Lloyd, P.J Ed.; John Wiley & Sons: New York **1988.**

3. Weiner, B. B.; Tscharnuter, W. W.; and Karasikov, N.; *Improvements in Accuracy and Speed Using the Time-of-Transition Method and Dynamic Image Analysis for Particle Sizing,* Theodore Provder, American Chemical Society, **1998**