

Certificate of Analysis

Product name: **Shape Reference Particles**
 Suspension
 Ordering-No.: 251-0121
 Batch No.: IBN3-3-100915-170-002

**Preliminary
Pattern !**

Product description:
 Shape: prolate spheroidal
 Particles density: 1259 kg m⁻³.
 Solids content: 2.5 %
 Material composition: engineered sporopollenin microparticles
 suspension in 50% ethanol solution (v/v)

Measurement method and device:

Determination of size values is carried out according to ISO 13322-1 and ISO 9276-6 by static image analysis using PowderShape - Particle Analysing System (Vers.5.1.1, IST - Innovative Sintering Technologies Ltd., Vilters, Switzerland).

For calibration of measurement instruments NIST- and BCR-compliant particle size standards are used. Calibration of measuring instrument is done periodically and controlled before measurement.

Table of certified shape descriptors:

Number of measured particles: 136,744

Shape descriptors	Formula	Mean value	Standard deviation [s]
Volume V [μm ³]		10,592.4 ¹⁾	2403.4
Area A [μm ²]		580.1 ¹⁾	84.4
Perimeter P [μm]		88.6 ¹⁾	6.6
Area equivalent diameter xA [μm]		27.1 ¹⁾	2.0
min Feret diameter xF _{min} [μm]		24.1 ¹⁾	3.4
max Feret diameter xF _{max} [μm]		42.5 ¹⁾	3.4
Aspect ratio	$\frac{xF_{min}}{xF_{max}}$	0.57 ¹⁾	0.08
Compactness	$\frac{\sqrt{4A}}{\sqrt{\frac{P}{\rho}}}$	0.64 ²⁾	0.03
Extent	$\frac{A}{xF_{max} \cdot xF_{min}}$	0.57 ²⁾	0.06
Circularity C (Form Factor FF)	$\sqrt{\frac{4\rho A}{P^2}}$	0.96 ²⁾	0.01

¹⁾ determined by Powdershape-5.1.1.(IST AG, Switzerland)

²⁾ calculated from original size parameters according to ISO 9276-6:2008

Date

Name

Signature