



**CERTIFICATE OF ANALYSIS**

**PRODUCT** : ZIRCONIUM DIOXIDE  
**GRADE** : EF-EXTRA  
**LOT NUMBER** : 8896 3,000 kg.  
**MANUFACTURING LOCATION** : BOW, NEW HAMPSHIRE, U. S. A.  
**SHIPPING DATE** : September 25, 2017

**CHEMICAL ANALYSIS - XRF METHOD**

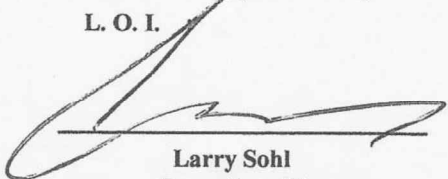
ZrO2 : 97.71 wt.	CaO : 0.02 wt.
HfO2 : 1.89 wt.	TiO2 : 0.02 wt.
SiO2 : 0.12 wt.	Y2O3 : 0.15 wt.
Na2O : 0.00 wt.	MgO : 0.00 wt.
Al2O3 : 0.00 wt.	U : 0.023 wt.
Fe2O3 : 0.05 wt.	Th : 0.014 wt.

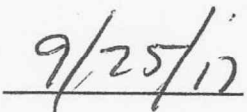
**PARTICLE SIZE DISTRIBUTION (By L&N Microtrac )**

Using	10 % less than :	0.47 um
Ultrasonic	50 % less than :	1.00 um
Dispersion	90 % less than :	11.22 um

**OTHER PHYSICAL DATA**

Surface Area (Calculated) : 6.50  
 L. O. I.

  
 Larry Sohl  
 Operations Manager

  
 9/25/17

PARTICLE SIZE ANALYSIS

EF-EXTRA: 8896

Date: 09/25/17 Meas #: 24748  
Time: 12:41 Pres #: 86



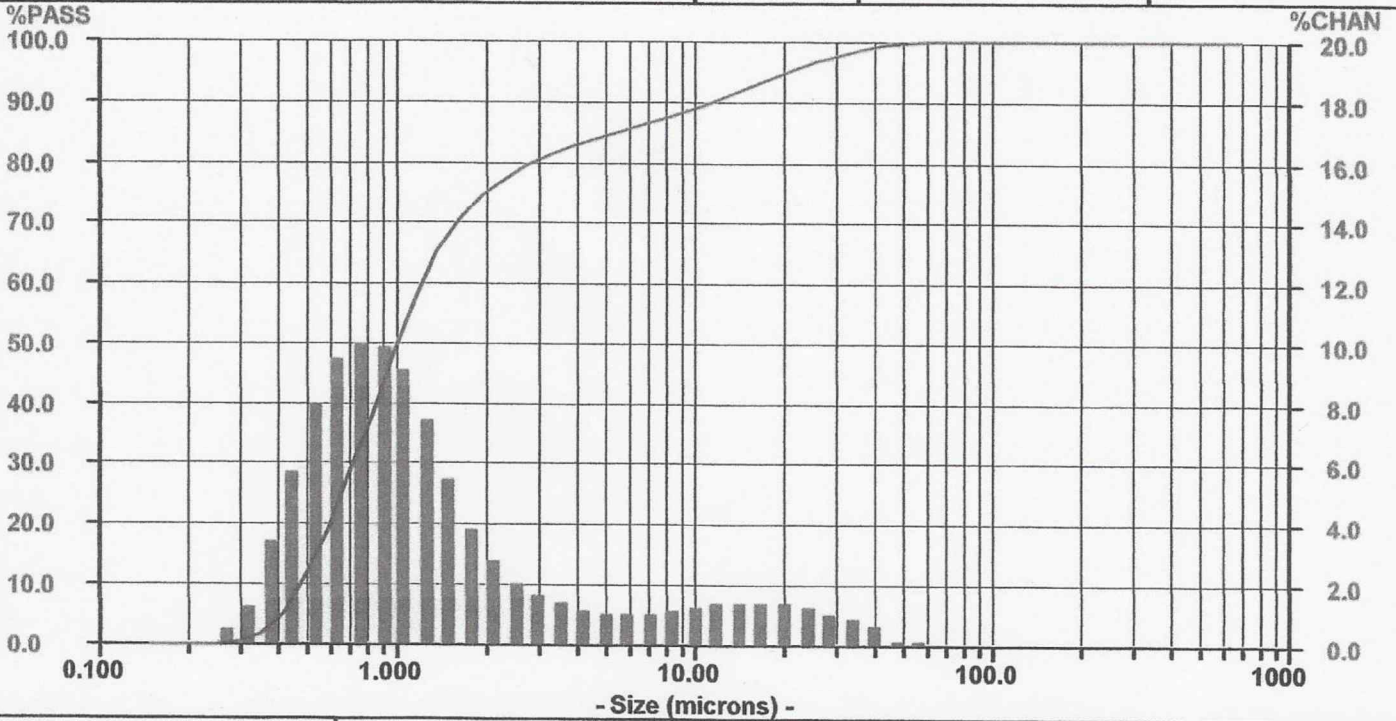
Summary

mv = 3.698  
mn = 0.508  
ma = 0.923  
cs = 6.503  
sd = 2.011

Percentiles

5% = 0.404 60% = 0.998  
10% = 0.473 60% = 1.211  
20% = 0.589 70% = 1.585  
30% = 0.705 80% = 2.834  
40% = 0.836 90% = 11.22

Dia	Vol%	Width
12.25	19%	21.97
0.846	81%	0.992



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	88.55	1.19						
592.0	100.00	0.00	7.778	87.36	1.10						
497.8	100.00	0.00	6.541	86.26	1.06						
418.6	100.00	0.00	5.500	85.20	1.11						
352.0	100.00	0.00	4.625	84.09	1.24						
296.0	100.00	0.00	3.889	82.85	1.44						
248.9	100.00	0.00	3.270	81.41	1.73						
209.3	100.00	0.00	2.750	79.68	2.13						
176.0	100.00	0.00	2.312	77.55	2.79						
148.0	100.00	0.00	1.945	74.76	3.88						
124.5	100.00	0.00	1.635	70.88	5.56						
104.7	100.00	0.00	1.375	65.32	7.50						
88.00	100.00	0.00	1.156	57.82	9.13						
74.00	100.00	0.00	0.972	48.69	9.98						
62.23	100.00	0.22	0.818	38.71	10.12						
52.33	99.78	0.21	0.688	28.59	9.51						
44.00	99.57	0.71	0.578	19.08	7.99						
37.00	98.86	0.89	0.486	11.09	5.77						
31.11	97.97	1.11	0.409	5.32	3.43						
26.16	96.86	1.29	0.344	1.89	1.30						
22.00	95.57	1.40	0.289	0.59	0.69						
18.50	94.17	1.46	0.243	0.00	0.00						
15.56	92.71	1.46	0.204	0.00	0.00						
13.08	91.25	1.40	0.172	0.00	0.00						
11.00	89.85	1.30	0.145	0.00	0.00						

Distribution: Volume	RunTime: 30 seconds	Fluid: Water
Progression: Standard	Run Number Avg of 3 runs	Fluid Refractive Index: 1.33
Upper Edge: 704.0	Particle: ZIRCONIA	Loading Factor: 0.0610
Lower Edge: 0.122	Particle Transparency: Trans	Transmission: 0.77
Residuals: Enabled	Particle Refractive Index: 2.17	Above Residual: 0.00
Number Of Channels: 50	Particle Shape: Irregular	Below Residual: 0.00
Filter: On	Database Path: C:\PARTIC~1\MICROT\MTW9117\2012-DB	Analysis Gain: 2

*[Signature]* 9/25/17  
LARRY SOHL (OPS. MANAGER) DATE