EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 132

CERTIFICATE OF ANALYSIS

QUARTZ

This certificate is valid for three year after purchase.

Sales date:

The minimum amount of sample to be used is 20 g.

DESCRIPTION OF THE SAMPLE

Each sample consists of a glass bottle filled with between 630 and 731 g of quartz gravel obtained by subdividing a bulk quantity of the material with the aid of a rotating riffle.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, November 1984
Revised: October 2007

Signed: 

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QUARTZ					
Mass fraction of particles undersize Q_3 [g/g]	Certified equivalent volume diameter x_v [1)] [µm]	Uncertainty [2)] [µm]	Mass fraction of particles undersize Q_3 [g/g]	Certified equivalent volume diameter x_v [1)] [µm]	Uncertainty [2)] [µm]
0.01	1386	6	0.51	2852	11
0.02	1478	6	0.52	2873	11
0.03	1542	6	0.53	2894	11
0.04	1593	6	0.54	2916	11
0.05	1637	6	0.55	2937	12
0.06	1676	6	0.56	2959	12
0.07	1712	5	0.57	2983	12
0.08	1745	5	0.58	3005	12
0.09	1776	5	0.59	3030	16
0.10	1806	5	0.60	3052	17
0.11	1835	5	0.61	3074	18
0.12	1862	5	0.62	3096	18
0.13	1889	5	0.63	3119	11
0.14	1914	6	0.64	3142	11
0.15	1941	6	0.65	3165	11
0.16	1967	6	0.66	3188	11
0.17	1994	6	0.67	3211	12
0.18	2021	6	0.68	3235	12
0.19	2047	6	0.69	3259	12
0.20	2073	6	0.70	3283	12
0.21	2098	7	0.71	3308	13
0.22	2123	7	0.72	3334	13
0.23	2149	7	0.73	3360	13
0.24	2174	6	0.74	3386	13
0.25	2202	6	0.75	3413	14
0.26	2234	7	0.76	3441	14
0.27	2261	7	0.77	3469	14
0.28	2288	7	0.78	3498	14
0.29	2315	7	0.79	3528	14
0.30	2342	7	0.80	3568	13
0.31	2369	7	0.81	3599	13
0.32	2395	8	0.82	3632	13
0.33	2422	8	0.83	3666	13
0.34	2448	8	0.84	3701	14
0.35	2474	8	0.85	3738	14
0.36	2498	8	0.86	3778	15
0.37	2521	8	0.87	3819	15
0.38	2545	8	0.88	3864	16
0.39	2570	8	0.89	3912	16
0.40	2595	8	0.90	3963	17
0.41	2620	9	0.91	4020	18
0.42	2644	9	0.92	4082	19
0.43	2668	9	0.93	4153	20
0.44	2692	9	0.94	4233	22
0.45	2715	12	0.95	4328	23
0.46	2747	11	0.96	4445	26
0.47	2766	10	0.97	4596	29
0.48	2787	10	0.98	4820	40
0.49	2809	10	0.99	5230	60
0.50	2830	11			

1) The certified value is the equivalent volume diameter x_v corresponding to the indicated value of Q_3, the mass fraction of particles undersize when measuring the particle size distribution by sieving. The certified value is traceable to results obtained with sieve analysis.

2) The uncertainty is calculated as a 95 % confidence interval based on the least square curve fitting of at least 15 sieves with mean measured Q_3 values on each side of the data point under consideration. If there were an insufficient number of sieves on any one side a compensating number of sieves on the other side were used to bring the total up to 30.

Indicative Value		
	Indicative value [1] [kg/m^3]	Uncertainty [2] [kg/m^3]
Density ρ_s	2629	6

1) The indicative value is the unweighted mean of the results obtained at 2 different laboratories, each using a pycnometry method.
2) The indicative uncertainty is the standard deviation of the averages of the participating laboratories.

ANALYTICAL METHOD USED FOR CERTIFICATION

The material is certified with respect to the cumulative distribution by mass of the equivalent volume diameter of the particles as measured by calibrated sieves [Powder Technology 24 (1979) 115]. This technique involved the counting of z particles of total mass m which only passed through the sieve. The equivalent volume diameter, x_v, is then given by the equation

$$x_v = \left(\frac{6m}{\rho_s \, \pi z} \right)^{1/3}$$

where m is the mass of the z particles counted and ρ_s is the density of the particles.

PARTICIPANTS

- Bayer AG, Leverkusen (DE)
- Bureau de Recherches Géologiques et Minières, Orléans (FR)
- National Physical Laboratory, Teddington (GB)
- Technische Universität Clausthal, Clausthal-Zellerfeld (DE)
- Technische Hogeschool, Delft (NL)
- University of Bradford, Bradford (GB)
- Universität Karlsruhe, Karlsruhe (DE)
- University of Technology, Loughborough (GB)

SAFETY INFORMATION

The usual laboratory safety precautions apply.

INSTRUCTIONS FOR USE

BCR-132 is intended to be used by laboratories either to test the accuracy and the effectiveness of their particle sizing procedures or alternatively to calibrate particle sizing instruments. If compatible with the measurement technique, the total sample should be used. If further subdivision is necessary, a rotating riffle is recommended for the abstraction of sub-samples down to about 1 g.
A stack of sieves, or a single sieve, with nominal mesh dimensions in the range 1400 to 5000 µm, may be calibrated using BCR-132 by sieving the whole of a single sample and weighing the various sieve fractions. The mass fractions of the particles passed by the individual sieves are then calculated and the process is repeated a number of times N to give mean values of Q_3 together with the associated standard deviations S_{Q_3}. The equivalent volume diameters of the cut sizes of the individual sieves are then obtained from the mean Q_3's by referring to the certified results contained in this certificate; linear interpolation between adjacent tabulated values of Q_3 will usually be necessary. It should be appreciated that these sieve calibrations are only strictly applicable when the sieves are used on materials consisting of particles with the same shape factors as the constituent particles of BCR-132.

The 95 % confidence interval of x_v for a calibration is the linear sum of the uncertainty indicated in the table of certified values and that due to the uncertainty in the value of Q_3. To calculate the latter contribution the range of values of x_v corresponding to $\overline{Q}_3 \pm \frac{t}{\sqrt{N}} . S_{Q_3}$ must be determined from the certified values where t is the Student's factor at the 5 % significance level for (N-1) degrees of freedom.

STORAGE

Specimens should be kept at ambient temperature in their original packing until used. However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

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NOTE

A technical report on the production of BCR-132 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

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