

THE INTERNATIONAL CONFERENCES ON VACUUM MICROBALANCE TECHNIQUES



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Chairman of the Steering Committee

The utilization of vacuum microbalance techniques has several roots. The balance is one of the earliest measuring instruments used by mankind: its history can be traced back more than 5000 years. The history of vacuum techniques began with the activities of Evangelista Torricelli and Otto von Guericke, some 370 years ago. The first kilogram vacuum balance was constructed in 1861 by De-lioul. It was used by Regnault in order to exclude buoyancy when controlling the mass standards of the newly introduced metric system. Thermogravimetric techniques were applied first to determine the moisture content of raw silk by Talabot at Lyon in 1833. The first vacuum microbalances, already with electromagnetic force compensation, were those of G. Urbain and Friedrich Emich, both produced in 1912. Further improvements of vacuum microbalances resulted from developments in the fields of electronics, magnetic materials and high-vacuum techniques. Increasing interest in microgravimetry subsequently stemmed from investigations of the reactions of solids with gas-phase (adsorption, desorption, chemisorption and heterogeneous catalysis) and various analytical methods, such as thermogravimetry, surface structure analysis by adsorption, density determination and the measurement of surface tension and of magnetic susceptibility. Thus, during the 1950s and 1960s, many sorption and thermo microbalances were developed: spring balances, electronic compensating beam balances, magnetic suspension balances and quartz resonators.

It became necessary to adapt the balance to the vacuum technique, but the vacuum apparatus additionally had to be modified for the requirements of the incorporated highly sensitive force transducer. Many disturbances (mechanical vibrations, thermally induced gas flow, contaminating vapour from the vacuum pump and other parts of the apparatus, leaks and magnetic and electrical influ-

Table 1 The Conferences on Vacuum Microbalance Techniques. (For abbreviations, see the list at the end of the Table)

#	Year	Place	Organizer	Proceedings
1	1960	Fort Monmouth, NJ, USA	M. J. Katz	M. J. Katz (Ed.): VMT, Vol. 1, 1961
2	1961	Washington, DC, USA	R. F. Walker	R. F. Walker (Ed.): VMT, Vol. 2, 1962
3	1962	Los Angeles, CA, USA	K. H. Behrndt	K. H. Behrndt (Ed.): VMT, Vol. 3, 1963
4	1964	Pittsburgh, PA, USA	P. M. Waters	P. M. Waters (Ed.): VMT, Vol. 4, 1965
5	1965	Princeton, NJ, USA	K. H. Behrndt	K. H. Behrndt (Ed.): VMT, Vol. 5, 1966
6	1966	Newport Beach, CA, USA	A. W. Czanderna	A. W. Czanderna (Ed.): VMT, Vol. 6, 1967
7	1968	Eindhoven, The Netherlands	C. H. Massen, J. A. Poulis	C. H. Massen, H. van Beckum (Eds): VMT, Vol. 7, 1970
8	1969	Wakefield, MA, USA	A. W. Czanderna	A. W. Czanderna (Ed.): VMT, Vol. 8, Plenum, New York 1971
9	1970	Berlin, Germany	Th. Gast, E. Robens	Th. Gast, E. Robens (Eds): PVMVT, Vol. 1, 1972
10	1972	Uxbridge, UK	S. C. Bevan, S. J. Gregg, N. D. Parkyns	S. C. Bevan, S. J. Gregg, N. D. Parkyns (Eds): PVMVT, 1973
11	1973	New York, NY, USA	A. W. Czanderna	JVST 11 (1974) 396-439
12	1974	Lyon, France	C. Eyraud, M. Escoubes	C. Eyraud, M. Escoubes (Eds): PVMVT, Vol. 3, 1975
13	1975	Philadelphia, PA, USA	W. Kollen	JVST 13 (1976) 541-560
14	1976	Salford, UK	D. Dollimore	D. Dollimore (Ed.), TA 24 (1978) 204-431

Table 1 Continued

#	Year	Place	Organizer	Proceedings
15	1977	Boston, MA, USA	P. Ficalora	JVST 15 (1978) 745-821
16	1978	Kiel, Germany	O. T. Sørensen, H.-J. Seifert	O. T. Sørensen (Ed.), TA 29 (1979) 198-360
17	1979	New York, NY, USA	A. W. Czanderna	JVST 17 (1980) 90-124
18	1981	Antwerpen, Belgium	R. de Batist, A. van den Bosch	E. Robens (Ed.), TA 51 (1981) 1-95
19	1982	Baltimore, MD, USA	R. Vasovsky	JVST 20 (1983)
20	1983	Plymouth, UK	S. A. A. Jayaweera	S. A. A. Jayaweera (Ed.), TA (1984)
21	1985	Dijon, France	N. Gérard	TA 103 (1986)
22	1987	Rabat, Morocco	L. Belkbir	TA 152 (1989)
23	1989	Middlesbrough, UK	S. A. A. Jayaweera	W. Hemminger (Ed.), TA 1993/94
24	1991	Hammamet, Tunisia	M. Jemal	W. Hemminger (Ed.), TA 1993/94
25	1993	Siegen, Germany	J. U. Keller, E. Robens	J. U. Keller, E. Robens (Eds): VMT'94
26	1995	Marrakech, Morocco	M. Ben Chanaa	M'barck Ben Chanaa (Ed.): VMT'95
27	1997	Lublin, Poland	P. Staszczuk	P. Staszczuk (Ed.): JTAC 1998/9
28	1999	Kiev, Ukraine	Yu. L. Zub, V. A. Tertykh	
29	2001	Middlesbrough, UK	S. A. A. Jayaweera	
30	2001	Casablanca, Morocco	K. Sbai	

JTAC: Journal of Thermal Analysis and Calorimetry, Akadémiai Kiadó, Budapest, Kluwer Academic Publishers, Dordrecht

JVST: Journal of Vacuum Science and Technology, American Institute of Physics, New York

PVMT: Progress in Vacuum Microbalance Techniques, Vol. 1-3, Heyden, London 1972-1975

TA: *Thermochimica Acta*, Elsevier, Amsterdam

VMT: Vacuum Microbalance Techniques, Vol. 1-8, Plenum Press, New York 1961-1971

VMT'94: J. U. Keller, E. Robens (Eds): Vacuum Microbalance Techniques '94, Multiscience Publishing, Brentwood 1994

VMT'95: M'barck Ben Chanaa (Ed.): Proceedings of the XXVth International Conference on Vacuum Microbalance Techniques. Faculté des Sciences Semlalia, Université Cadi Ayyad, Marrakech 1995.

ences), together with the sophisticated microbalance techniques, gave rise to the desire for the creation of a platform for discussions. Further, it was considered that the widely scattered literature on this topic should be brought together. Accordingly, the Conferences on Vacuum Microbalance Techniques were started in 1960 by K. H. Behrndt, W. E. Boggs, C. N. Cochrane, A. W. Czanderna, J. Efimenko, E. A. Gulbransen, R. D. Hampson, J. M. Honig, B. C. Johnson, O. M. Katz, S. Kosiba, A. D. Magnuson, D. B. Medved, T. N. Rhodin, P. M. Rodriguez, R. Schwoebel, R. F. Walker, S. P. Wolsky, E. Zdanuk and A. C. Zettelmoyer. Since that time, *ad hoc* conferences have been organized by interested participants, without sponsorship by any scientific society or any interested commercial enterprise (see the appended Table).

During the 1972 Conference, a continuation Steering Committee was formed, with A. W. Czanderna and E. Robens as co-chairmen. After 1970, the conferences were for a time organized alternately in Europe and the USA. At the 20th Conference, in Plymouth (which might well have been the last one), Al Czanderna retired, and since that time the conferences have been organized alternately in Europe and North Africa. The most important results of the discussions published in the proceedings were summarized in treatises on vacuum microgravimetry. The 28th Conference is scheduled for June 2-4, 1999 in Kiev, Ukraine.

References

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- S.P. Wolsky, E.J. Zdanuk (Eds): *Ultra Micro Weight Determination in Controlled Environments*. Interscience, New York 1969
- A.W. Czanderna, S.P. Wolsky (Eds): *Microweighing in Vacuum and Controlled Environments*. Elsevier, Amsterdam 1980.
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