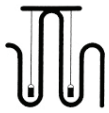

MICROBALANCE TECHNIQUES

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Editors:

Prof. Dr. Jürgen U. Keller

Institut für Fluid- und Thermodynamik,
Universität - Gesamthochschule Siegen

Ing. Erich Robens

Institut für Anorganische und Analytische Chemie,
Johannes Gutenberg - Universität Mainz

History of the vacuum macrobalance

H.R. Jenemann[a] and E. Robens[b]

[a]Schwedenstraße 7E, D - 65239 Hochheim, Germany
[b]Institut für Anorganische Chemie und Analytische Chemie der Johannes-Gutenberg-Universität, D - 55099 Mainz, Germany

If a balance is loaded with a sample, the readings at equlibrium deviate in general from the true sample mass as well as by statistical errors and by systematic influences. One systematic influence on the weighing results in the gravitational field is buoyancy. In general, buoyancy is corrected computationally, taking into account the density of air and of sample and weights. Buoyancy can be avoided by weighing in vacuo, but when excluding the atmosphere disturbances of other kind occur. Vacuum macrobalances have been designed as mass comparators, for the determination of atomic mass and other chemical needs. The present paper deals with the history of vacuum macrobalances which starts in the middle of the ninteenth century.

1. INTRODUCTION

At the Middlesbrough Conference on Vacuum Microbalance Techniques, the development of the vacuum microbalance [1] with the load capacity up to some grams was retraced. The first vacuum balances, however, were kilogram balances exhibiting a sensitivity in the milligram range [2]. In the middle of the 19th century vacuum was applied first to exclude buoyancy errors in metrological weighings and later on for research in chemistry. Therefore the historical scope of the macrobalance with load capacities above 100 grams is going to be supplemented. This will begin with an outline of the historical and technical background and than a description of first the historical development of metrological balances and secondly of chemical macrobalances.

2. BACKGROUND

Weighing results of equal armed balances exhibiting a specific sensitivity of 10^{-3} as used in trade need corrections of systematic errors neither of unequal arm length of the balance beam, nor of buoyancy. Even in the 18th century, however, the specific sensitivity of balances was improved to about 10^{-6}. Scientists became aware of such systematic errors and they started to develop methods to diminish the influence of unsymmetries of the symmetric balance.

Author Jenemann, H.R. / Robens, E.

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