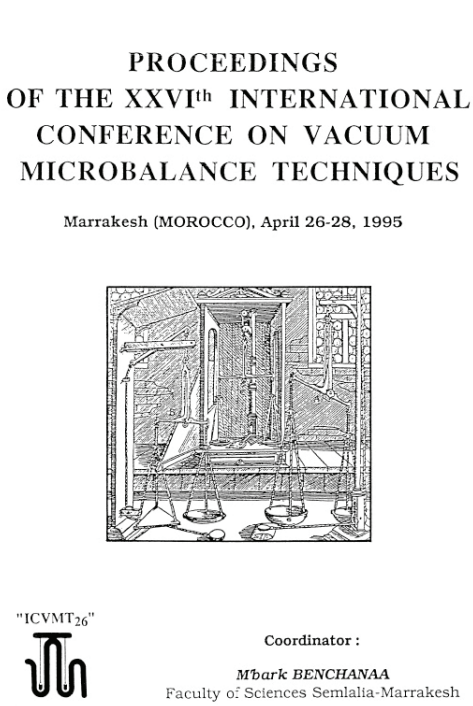
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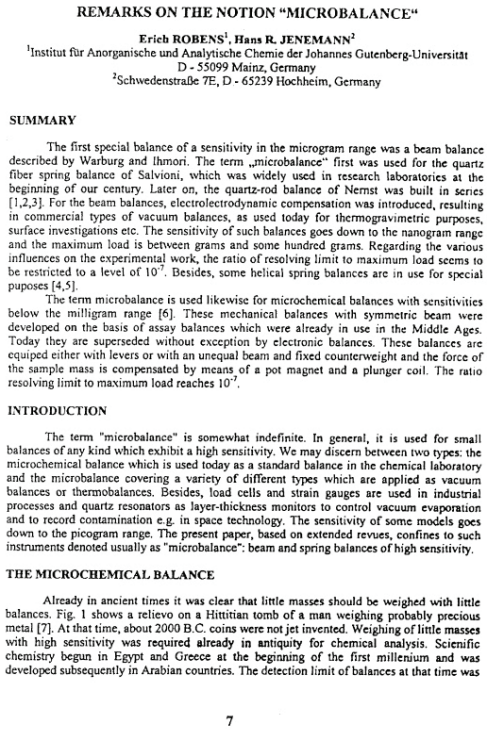
REMARKS ON THE NOTION "MICROBALANCE"

Erich ROBENS[1], Hans R. JENEMANN[2]
[1]Institut für Anorganische und Analytische Chemie der Johannes Gutenberg-Universität
D - 55099 Mainz, Germany
[2]Schwedenstraße 7E, D - 65239 Hochheim, Germany

SUMMARY

The first special balance of a sensitivity in the microgram range was a beam balance described by Warburg and Ihmori. The term „microbalance" first was used for the quartz fiber spring balance of Salvioni, which was widely used in research laboratories at the beginning of our century. Later on, the quartz-rod balance of Nernst was built in series [1,2,3]. For the beam balances, electrolectrodynamic compensation was introduced, resulting in commercial types of vacuum balances, as used today for thermogravimetric purposes, surface investigations etc. The sensitivity of such balances goes down to the nanogram range and the maximum load is between grams and some hundred grams. Regarding the various influences on the experimental work, the ratio of resolving limit to maximum load seems to be restricted to a level of 10^{-7}. Besides, some helical spring balances are in use for special puposes [4,5].

The term microbalance is used likewise for microchemical balances with sensitivities below the milligram range [6]. These mechanical balances with symmetric beam were developed on the basis of assay balances which were already in use in the Middle Ages. Today they are superseded without exception by electronic balances. These balances are equiped either with levers or with an unequal beam and fixed counterweight and the force of the sample mass is compensated by means of a pot magnet and a plunger coil. The ratio resolving limit to maximum load reaches 10^{-7}.

INTRODUCTION

The term "microbalance" is somewhat indefinite. In general, it is used for small balances of any kind which exhibit a high sensitivity. We may discern between two types: the microchemical balance which is used today as a standard balance in the chemical laboratory and the microbalance covering a variety of different types which are applied as vacuum balances or thermobalances. Besides, load cells and strain gauges are used in industrial processes and quartz resonators as layer-thickness monitors to control vacuum evaporation and to record contamination e.g. in space technology. The sensitivity of some models goes down to the picogram range. The present paper, based on extended revues, confines to such instruments denoted usually as "microbalance": beam and spring balances of high sensitivity.

THE MICROCHEMICAL BALANCE

Already in ancient times it was clear that little masses should be weighed with little balances. Fig. 1 shows a relievo on a Hittitian tomb of a man weighing probably precious metal [7]. At that time, about 2000 B.C. coins were not jet invented. Weighing of little masses with high sensitivity was required already in antiquity for chemical analysis. Scienific chemistry begun in Egypt and Greece at the beginning of the first millenium and was developed subsequently in Arabian countries. The detection limit of balances at that time was

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

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Remarks Two versions, with different number of pages, illustrations and endnotes.