Top-Performance Thermogravimetry – Thermobalance NETZSCH TG 439

Every conscientious thermoanalytical experimentator knows which traps best to avoid when preparing and evaluating thermogravimetric measurements. In the end for most commercial thermobalances the obtainable detection limit is restricted by drift and noise as well as remaining uncertainties after the obligatory empirical buoyancy correction.

These disadvantages and others more could be eliminated in the development of the NETZSCH Thermo Microbalance TG 439. Starting from the twin-furnace system, the construction of a highly-sensitive and reliable TG instrument was possible by a consequently symmetrical construction principle of the bottom-loaded balance, heating and gas control.

The possibility of evacuation ensures an optimal control of the sample atmosphere. An elaborate gas conduct system and separate purging of the weighing cell protect the balance chamber from condensating and aggressive sample degasing.

Buoyancy effects are extremely minimized due to the identical conditions on both sides of the balance beam. Thus, in general, a time-consuming correction is not necessary. Because of the excellent reproducibility of the measuring signal, depicted in graph 1, the null curve can be reliably substracted with extreme measuring tasks, if this should be necessary. Reproducibility is, of course, an essential property also for comparative measurements, i.e. in routine quality control.

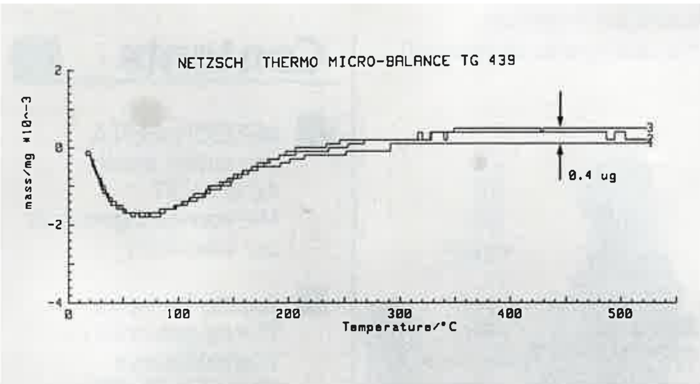


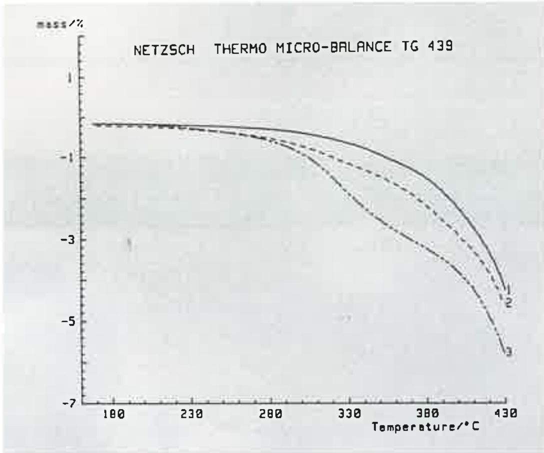
Abb. 1 Reproducibility of the null curve

Due to a resolution of just 0.1 μg and a long-term drift of 0.13 μg/h at 1000° C, this microbalance is predestined for the determination of extremely small weight changes, e.g. oxidations or sorptions and also for work with sample weights in the submilligram range. The latter gives the advantage of narrow reaction intervals, reduces effects due to sample constitution and allows high heating rates.

The depicted curves, measured in N_2-flow, also show furthermore that dynamics gas control does not cause any disturbances.

No condensation effects, which can falsify the reading by some percentage points in several TG instruments, could be observed when measuring anthracen until complete evaporation of the substance.

Abb. 2
Comparitive TG tests of pigments



The TG curves obtained from pigments (graph 2) are an example of the exact detection of smallest losses in weight. Measurements were conducted with sample weights of 2 mg; the highest detected loss in weight was 5.6 % i.e. a mass of just 0.13 mg. Differences between different changes of the product become obvious despite this little overall effect.

The detection of small changes in weight on relatively high amounts of sample does not cause any problems for the NETZSCH TG 439 either, as can be seen from graph 3. Here the oxidation of an iron sample (100.75 mg) in oxygen flow during a multistage temperature programme is shown.

The reaction takes place mainly between 350° C and 650° C and is connected with a gain in weight of 1.7 mg.

Thus this microbalance can be recommended as an ideal aid in testing surface and degasing processes as well as in detecting and quantifying volatile residues and additives in all kinds of materials (polymers, precipitation products etc.).

Like all the NETZSCH balances, the TG 439 can be coupled with a quadrupole mass spectrometer to make a simultaneous qualitative analysis of released gases possible.

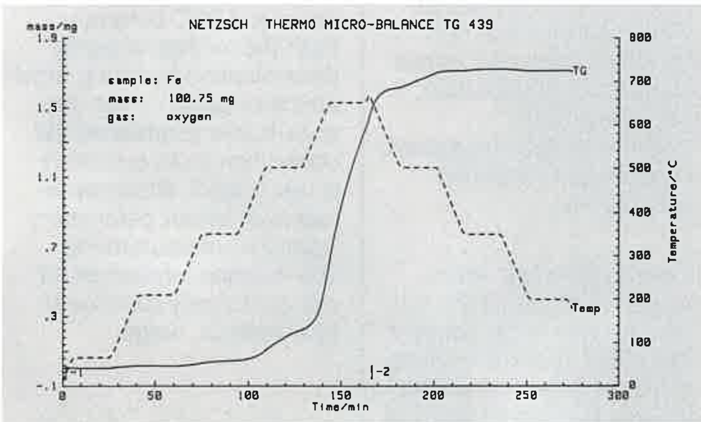


Abb. 3 TG curve of oxidation (Fe)