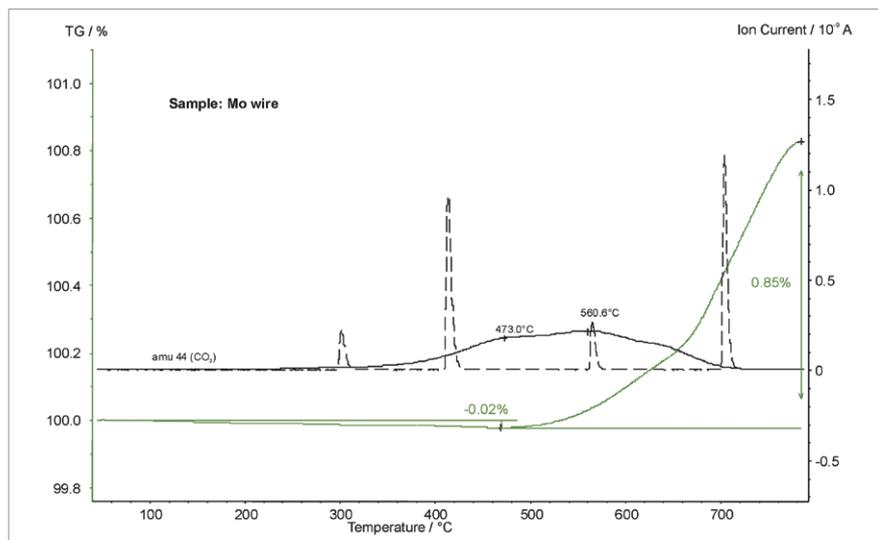# APPLICATION **SHEET**

METALS / ALLOYS – METAL INDUSTRY

MOLYBDENUM WIRE

A wire is a single, usually cylindrical, elongated strand of drawn metal. Wires are used to bear mechanical loads and to carry electricity and telecommunication signals. Metals useful for producing wires must in the first place be ductile and strong intension. Metals suitable for wires are, for example, platinum, silver, iron, copper, aluminium and gold. Special purpose wires, however, are made using other metals (e.g. tungsten wire for light bulbs and vacuum tube filaments, because of its high melting temperature). Molybdenum is frenquently employed in the construction of powder tube grids and support structures which also require a high-temperature strength, low vapor pressure and low thermal expansion. High-temperature vacuum and hydrogen atmosphere furnaces also rely on the use of molybdenum rod and wire to form resistant heating elements.

Results

A molybdenum wire sample was heated in a dynamic air atmosphere. Below ~500°C, a small mass loss of 0.02% occurred followed by an increase in sample mass of 0.85%. This increase is due to oxidation of the sample. At the same, time carbon impurities on the wire surface are burnt what can be seen from the mass spectrometer signal for mass number 44 due to the CO_2 evolvement (full line). The carbon amount could be quantified to ~900ppm by means of the Netzsch *Pulse*TA® device: During an empty run, several CO_2 pulses of defined volumes (0.25 ml and 1 ml) were injected into the STA which was detected by the mass spectrometer (dashed line). From the ratio of the ion current peak areas of the calibration pulses and the signal from the sample, the amount of evolved CO_2 from the sample can be calculated. The sensitivity of the NETZSCH mass spectrometer is linear and temperature-independent.

Instrument
STA 449 C *Jupiter*® – QMS 403 *Aëolos*®

Test Conditions

Temperature range	RT ... 800°C
Heating/cooling rates	10 K/min
Atmosphere	Synthetic air at 70 ml/min
Sample mass	4153.9 mg
Crucible	Al_2O_3 breaker
Sensor	TG type S

NETZSCH