Thermal analysis

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TGA/DSC

- Characterize samples by measuring change in mass as a function of temperature Provides information:
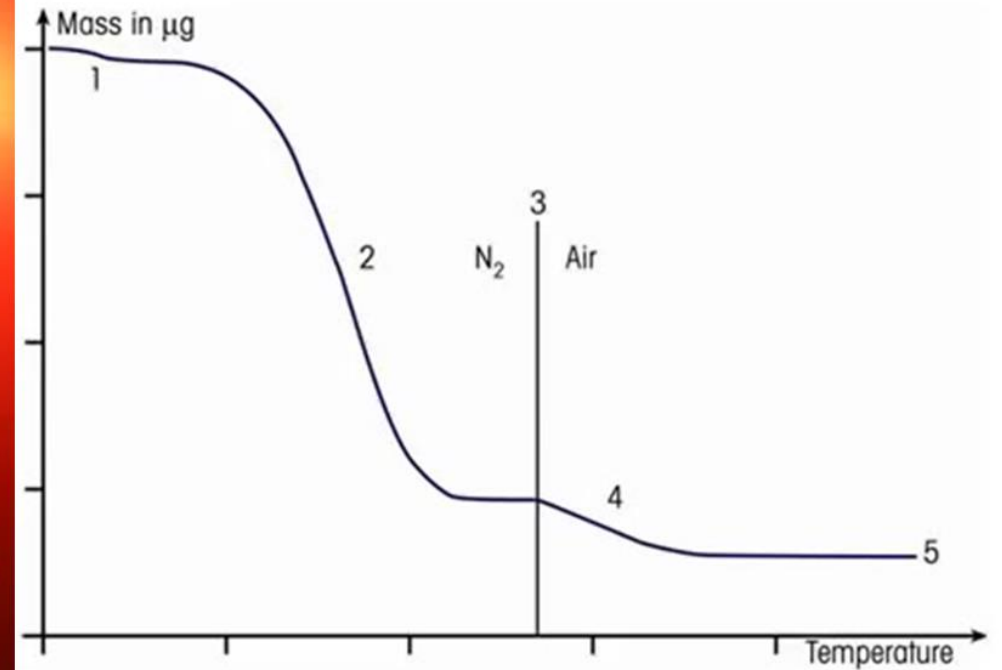
- Composition

- Purity

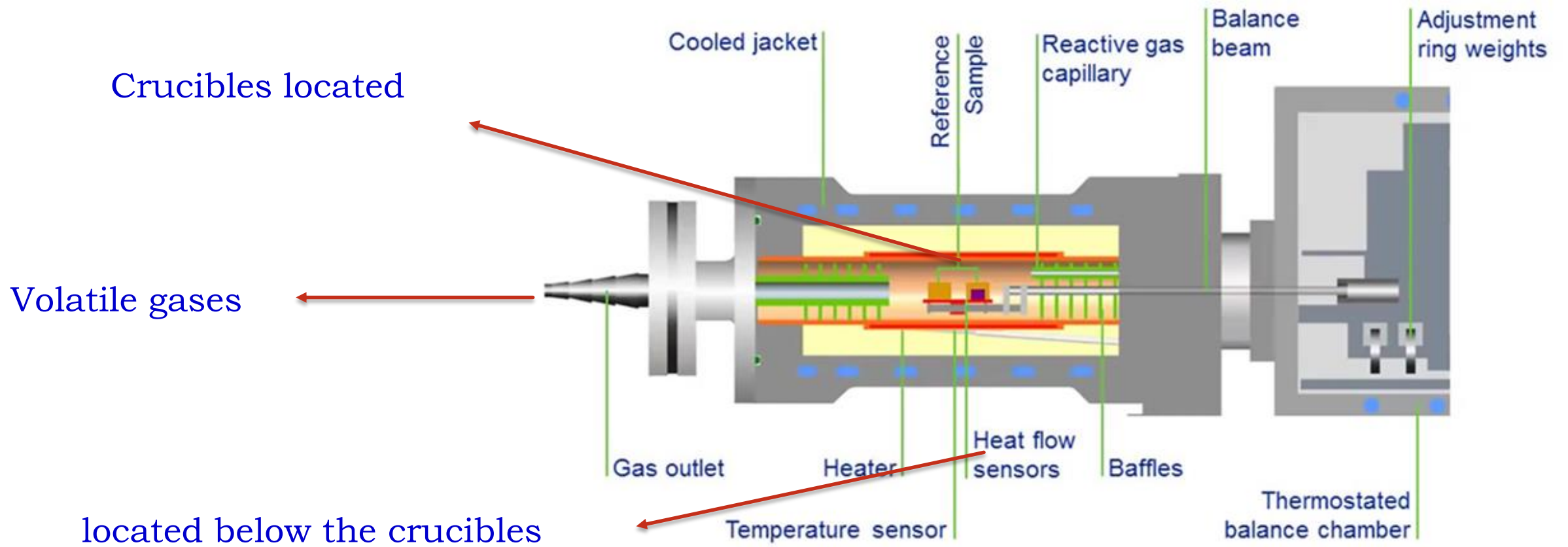- Moisture content

- Decomposition

The principles
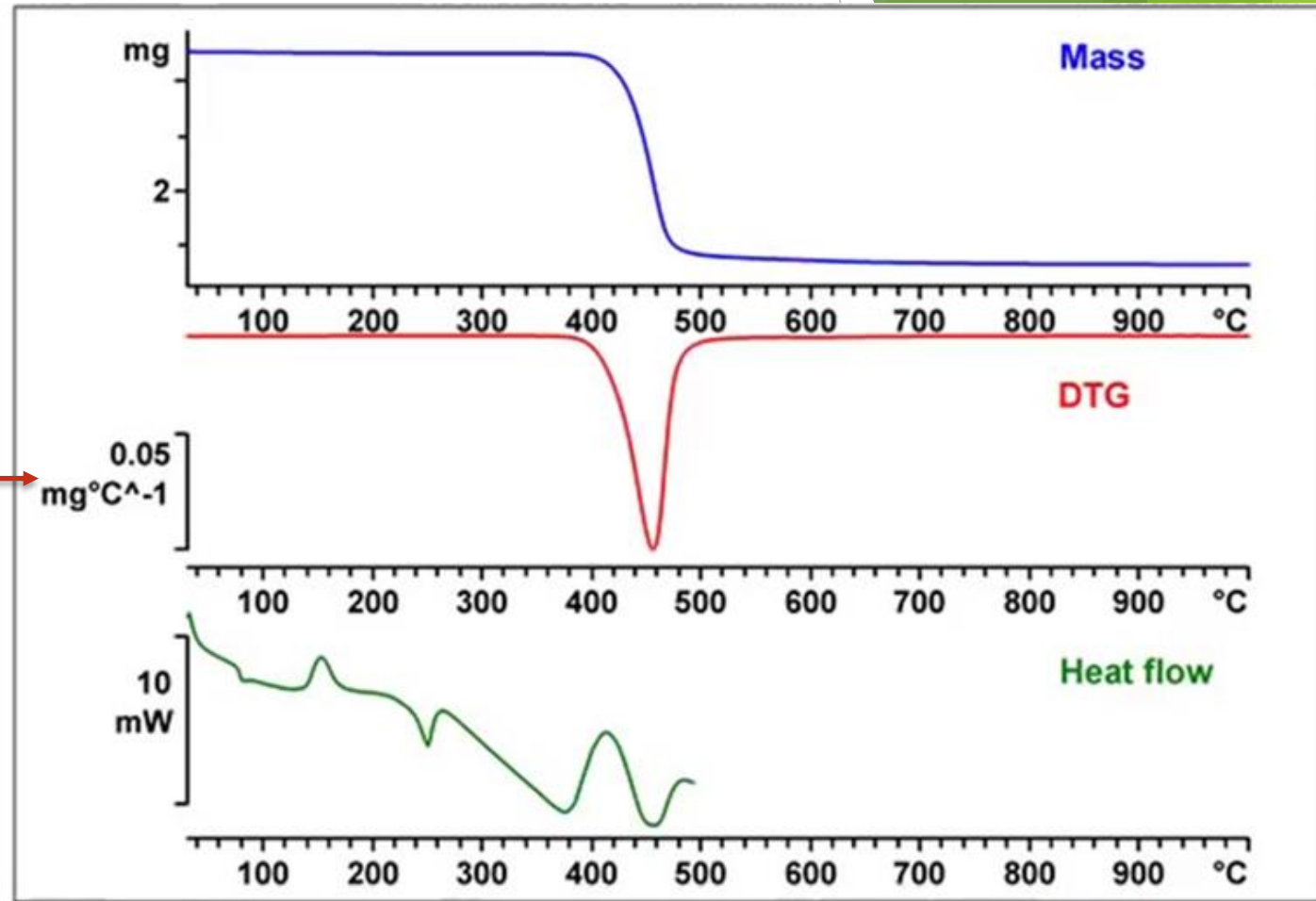
Burning Match decreases in mass
Leaving ashes

1. Loss of volatile components
2. Decomposition
3. Atmosphere is switched from N_2 to O_2
4. Combustion of the carbon
5. Ashes

TGA/DSC

Crucibles located

Volatile gases

located below the crucibles

Prevents environmental influences

Cooled jacket

Reference

Sample

Reactive gas capillary

Balance beam

Adjustment ring weights

Gas outlet

Heater

Heat flow sensors

Baffles

Temperature sensor

Thermostated balance chamber

TGA/DSC curves

Mass Loss

Derivative the of the weight loss

Heat flow

TGA/DSC sensors

Equipped with 3 different sensors

Measures sample and reference temperatures below ceramic support

TGA/DSC

Measures sample and reference temperatures

TGA/TDA

Measures sample temperatures

TGA/STDA

TGA/DSC balance

Automatic internal weigh/ external weigh
 measurements
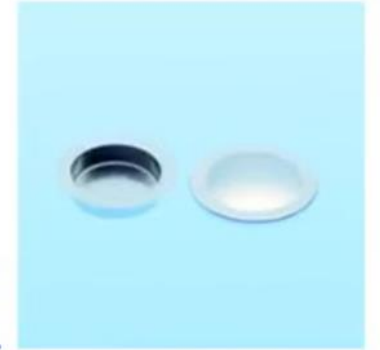

Analyse up to 50 million compounds

TGA/DSC crucibles

Materials used as crucibles are important for achieving good results

Mostly used ⟶

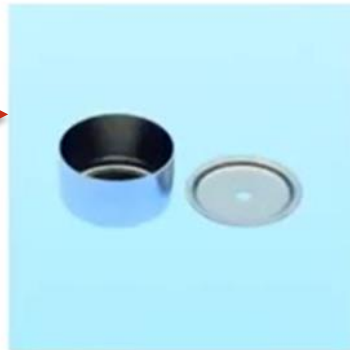Alumina crucibles with lids:
30, 70, 150, and 900 µL

Less expensive (0-600°C) ⟶

Aluminum crucibles with lids:
20, 40, 100, and 160 µL

High quality of the signal ⟶

Platinum crucibles with lids:
30, 70 and 150 µL

Sapphire crucible with lid:
70 µL

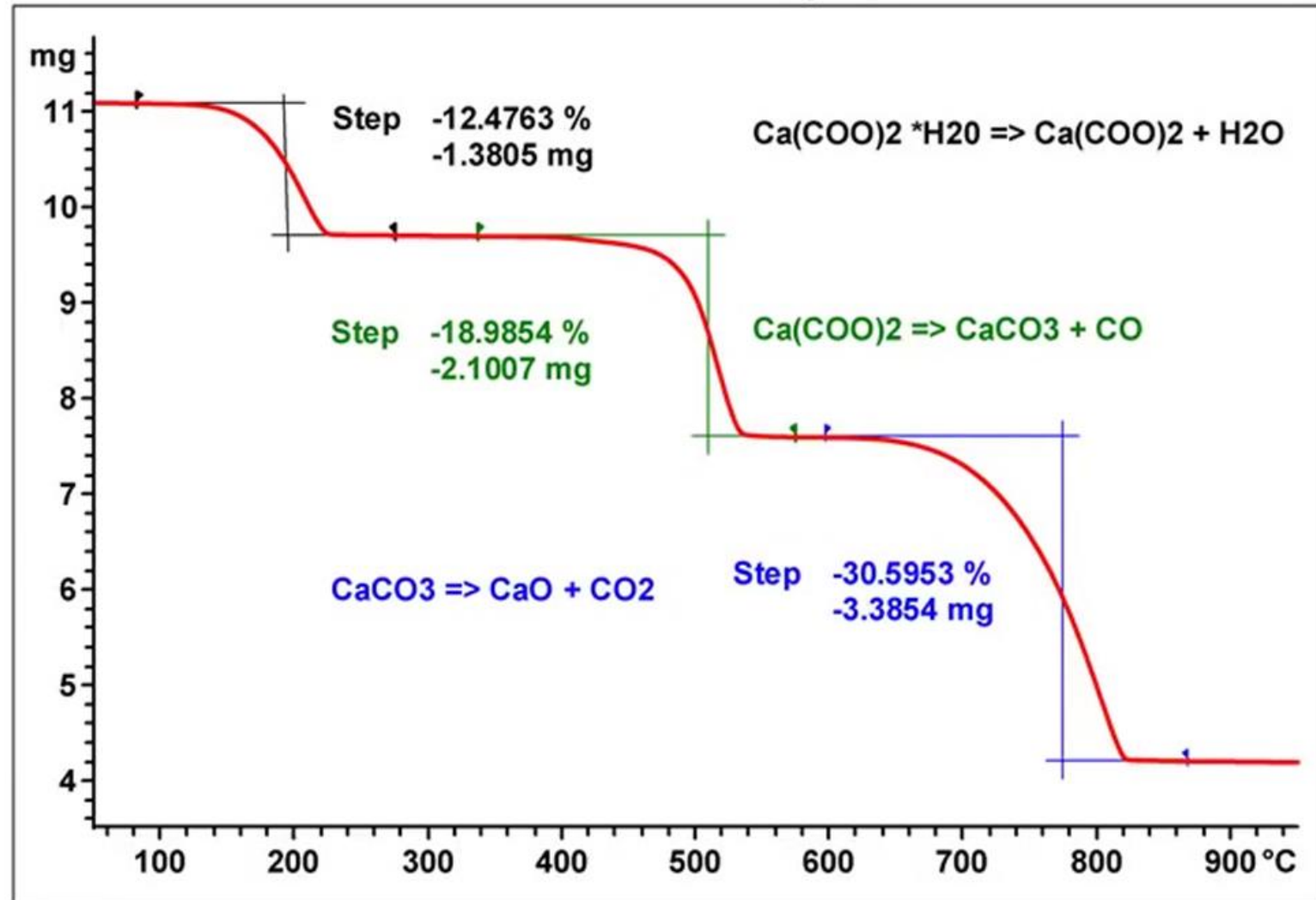Liquid metals at high temperatures ⟶

TGA/DSC measurement possibilities

▶ Temperature ramp (used for loss of moisture)

▶ Isothermal measurements (oxidation induction time)

▶ Measurement under vacuum (separation of vaporization)

▶ Measurement atmosphere (determines the ash content)

Temperature ramp

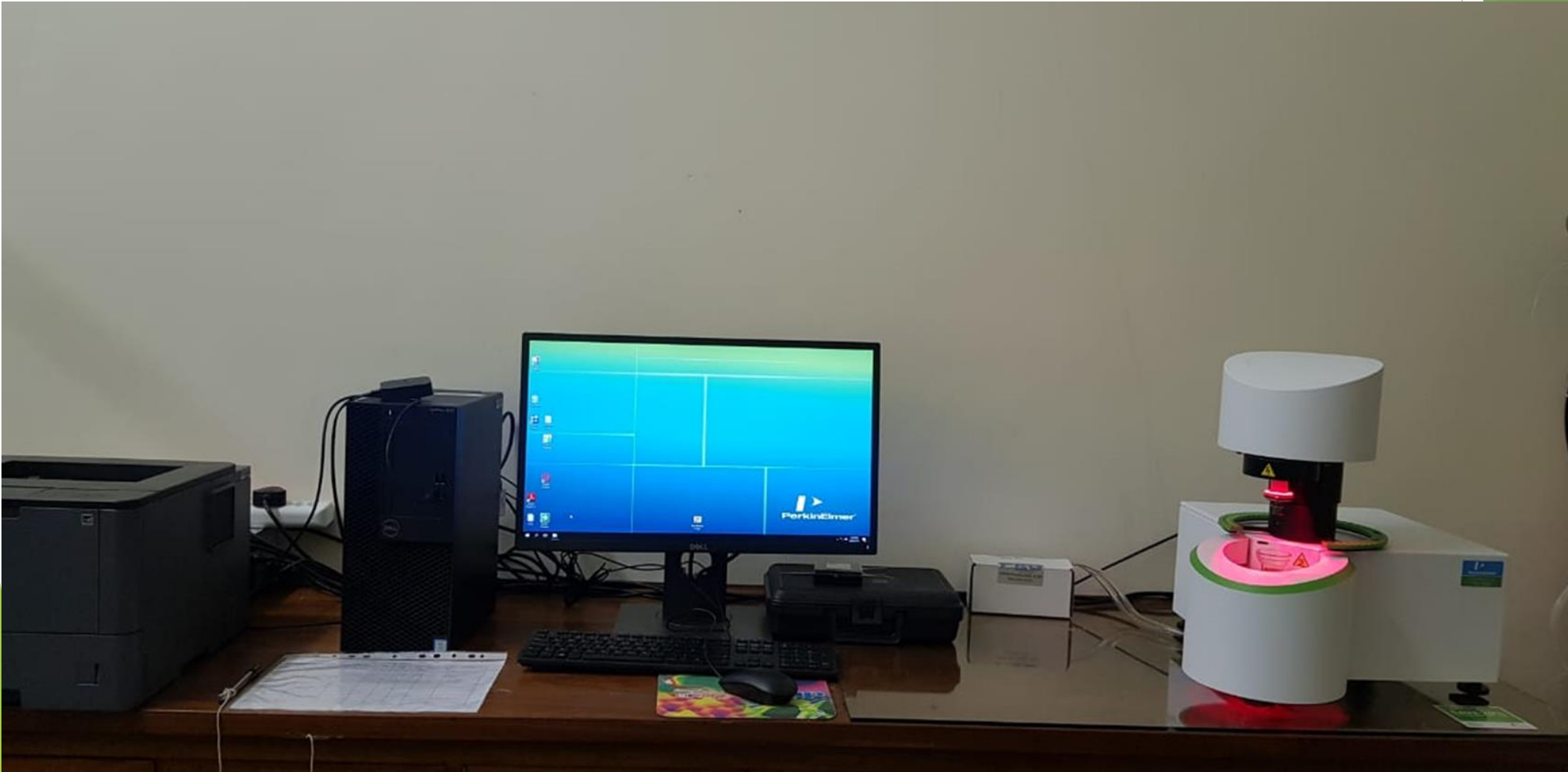1. Loss of Water

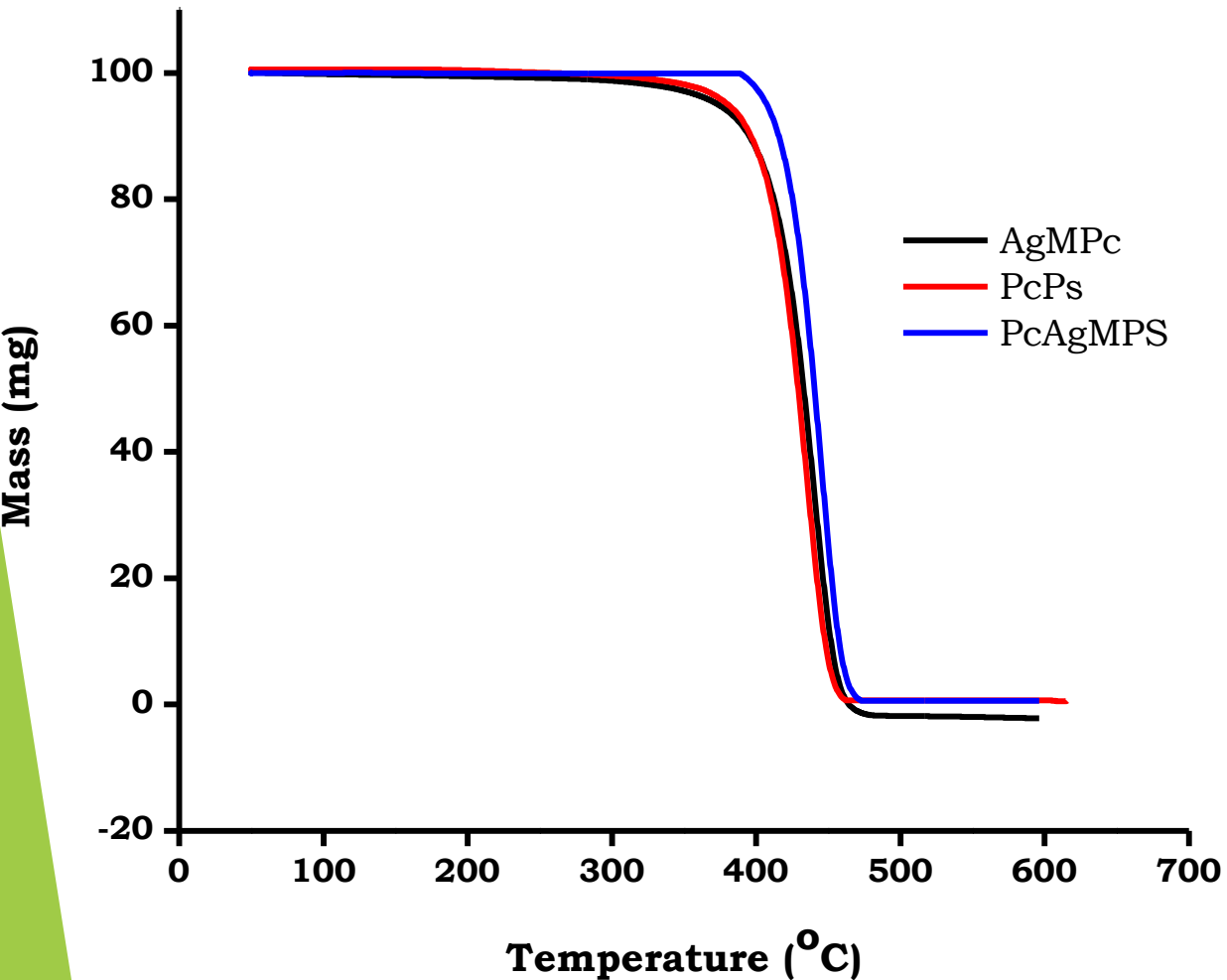2. Decomposition

3. Decomposition reaction

Step   -12.4763 %
       -1.3805 mg

$Ca(COO)_2 *H_2O => Ca(COO)_2 + H_2O$

Step   -18.9854 %
       -2.1007 mg

$Ca(COO)_2 => CaCO_3 + CO$

$CaCO_3 => CaO + CO_2$

Step   -30.5953 %
       -3.3854 mg

Applications

- Pharmaceutical industries: Quality control

- Food industries: Quality assurance

- Science/research: Stability, quantitative analysis

- Paints : drying

Science

Results

Thermograms of the photocatalysts in the fibre
They reveal
largest thermal stability for
Pc-Ag-M-mph.

Summary

TGA/DSC Manual and automated operation

❑Measures Mass loss and heat flow

❑Quality assurance

❑Research and development

Thank you for listening