In-situ analysis of the furnace atmosphere during thermal debinding via FTIR
Many production routes for cellular metals use organic templates and binders.

Thermal debinding is currently the most important approach for the removal of organic constituents.

Use of FTIR with Q-MACS and MS for in-situ gas analysis for the improvement of thermal debinding cycles.

Specialised furnace with infrared windows.
Mass spectrometry (MS): not ideally suited for in-situ and kinetic studies; first peak ok, but atmosphere stays in the capillary and biases further measurements

➔ FTIR is sometimes better suited for kinetic studies

- FTIR is fast (measurement times in the range of seconds)
- IFAM operates specialised furnace with infrared windows and long beam path for the study of thermal decomposition processes
Example for simultaneous MS and FTIR measurement

In-situ Process Gas Analysis

- **FTIR**
  - CO
  - H₂O

- **MS**
  - m16
  - m44

- Stainless steel 430L
- Predebindered ArH₂
- ArO₂ (97/3)

**Graphical Data**
- Integrated FTIR absorbance peak area vs. time [hh:mm]
- Ion current intensity [10⁻¹¹ A]
- Temperature [°C]

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Proposal for kinetic studies via FTIR

FTIR measurements during thermal debinding

Samples

- Representative MIM parts which undergo a thermal debinding step after solvent debinding

Questions to be addressed:

- Influence of gas volume flow, gas composition, and furnace loading on the decomposition process \(\Rightarrow\) optimization of thermal debinding in terms of time and gas consumption

- Identification of critical operating conditions (detection of strongly non-linear dependencies between furnace loading and operating conditions) \(\Rightarrow\) avoidance of faulty batches