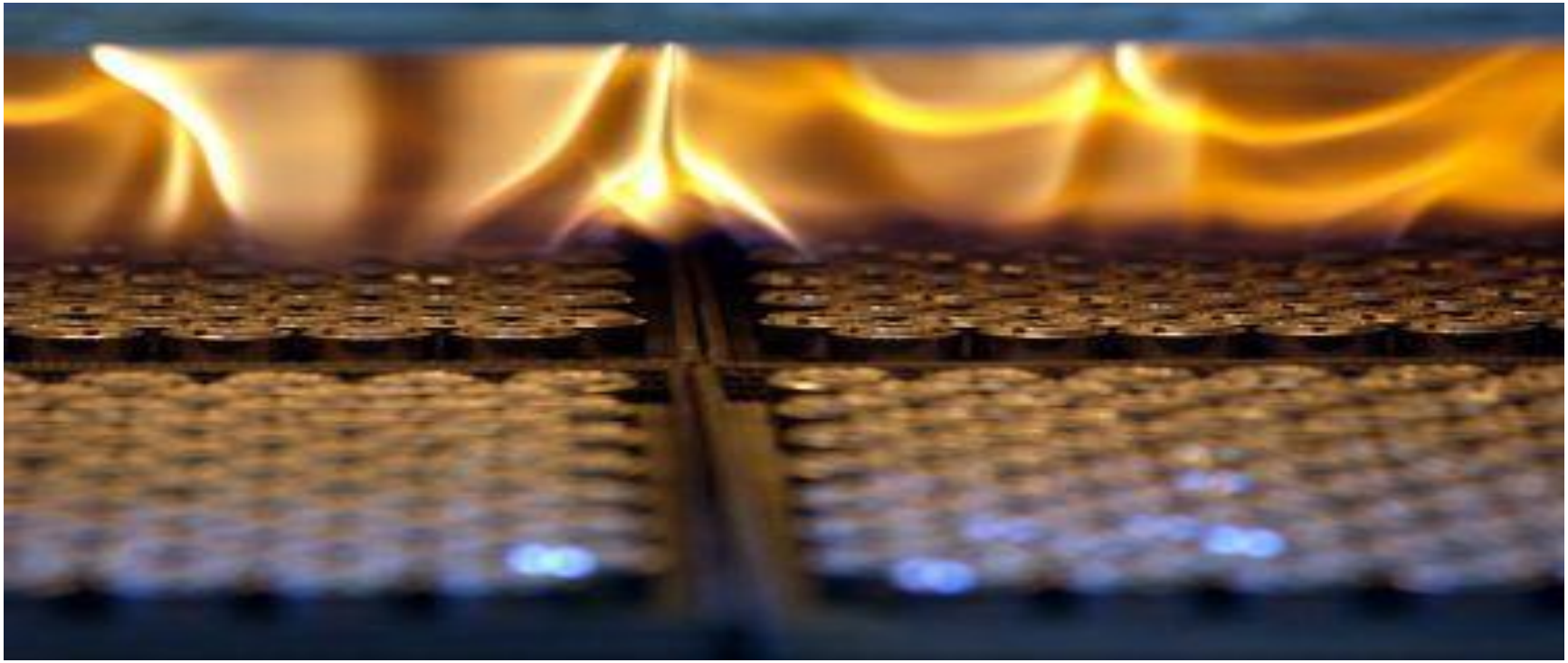
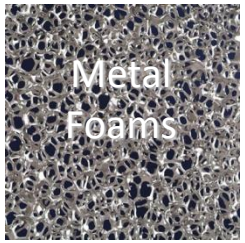
In-situ analysis of the furnace atmosphere during thermal debinding via FTIR

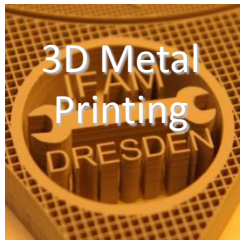


Background of FTIR studies at IFAM Dresden

FTIR measurements during thermal debinding

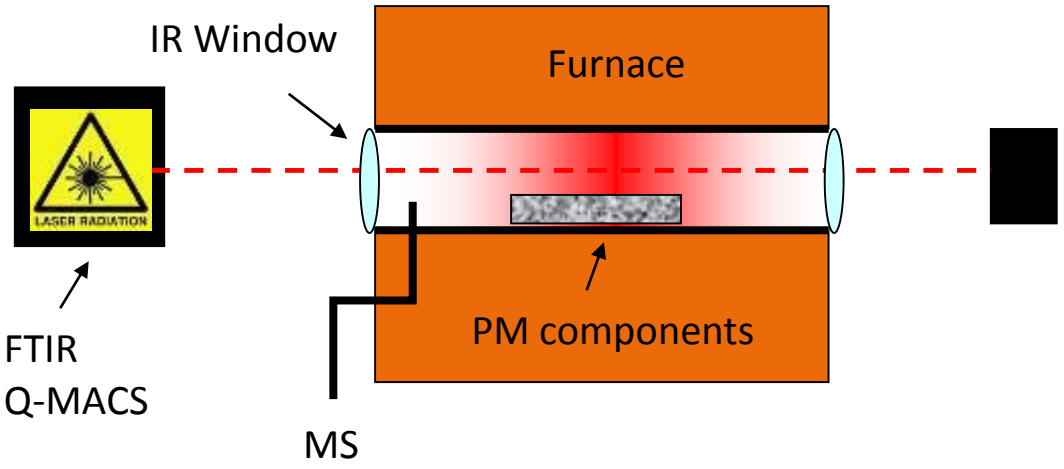
- Many production routes for cellular metals use organic templates and binders
- Thermal debinding is currently the most important approach for the removal of organic constituents
- Use of FTIR with Q-MACS and MS for in-situ gas analysis for the improvement of thermal debinding cycles
- Specialised furnace with infrared windows





Fast Fourier Transform Infrared Spectroscopy (FTIR)

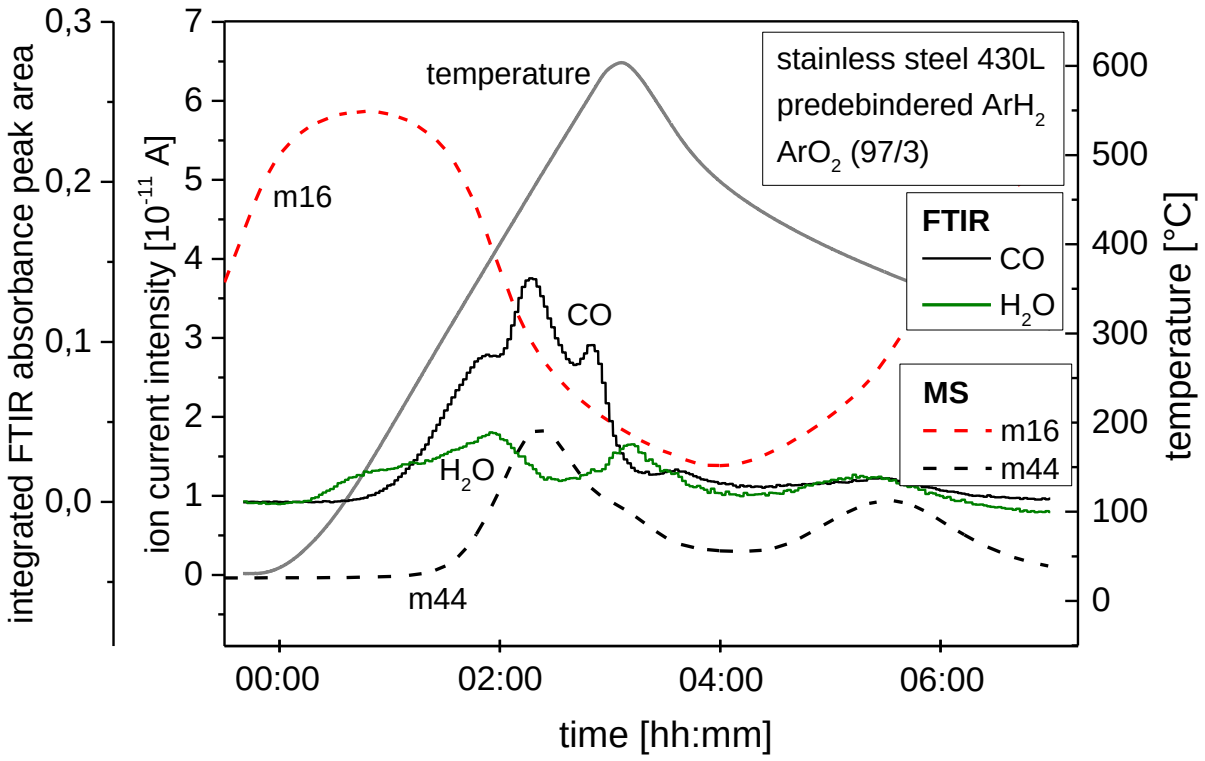
In-situ Process Gas Analysis



- 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



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 adressed:

- Influence of gas volume flow, gas composition, and furnace loading on the decomposition process ➔ 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) ➔ avoidance of faulty batches