New Purifier Material for Removal of Trace Organic Contaminants from Process Gases

Hans Funke, Dan Fraenkel, Jon Welchhans, Dave Lawrence, Mark Raynor, and Virginia Houlding

Matheson Tri-Gas, ATC Longmont

semi Semiconductor Equipment and Materials International

Trace hydrocarbon impurities - from where?

- source gases (cylinders, raw material)
- system component outgassing
  (Pump Oil, MFC's, valves, lines..)

Why are they problematic?

decreased device performance in Si processes

- poly-Si, Si_3N_4, well formation, field oxides,
  EPI-Si, Al deposition, ...
- carbon as dopant?

Current Purifier Technologies

organometallic resins
- HC's not removed

functionalized inorganic supports
- HC's not removed

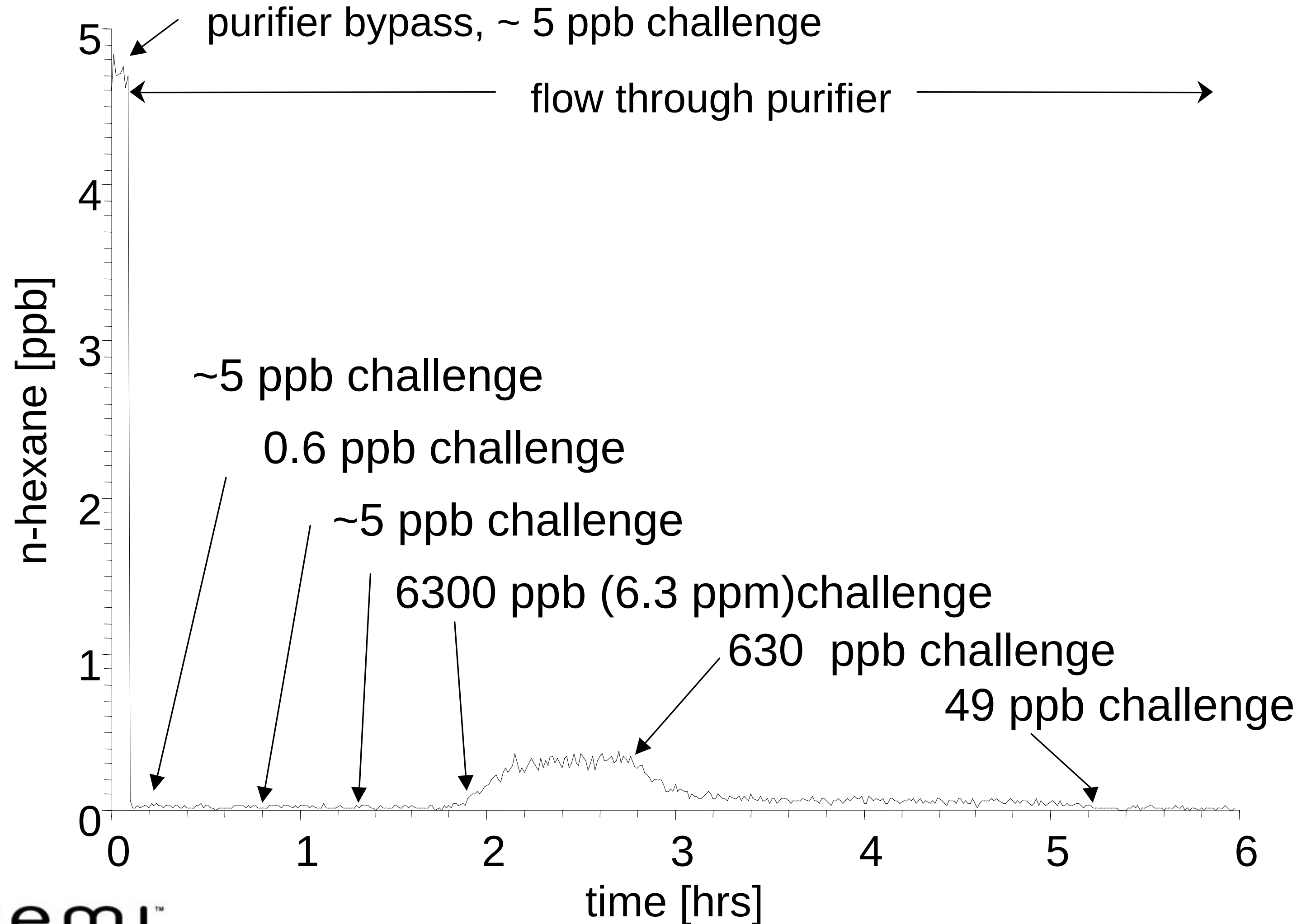
oxide based inorganic materials
- NM-HC's removed

heated Getters (e.g. Zr/Fe/V-based)
- All HC's removed

semi™
Semiconductor Equipment and Materials International

n-Hexane Removal Efficiency

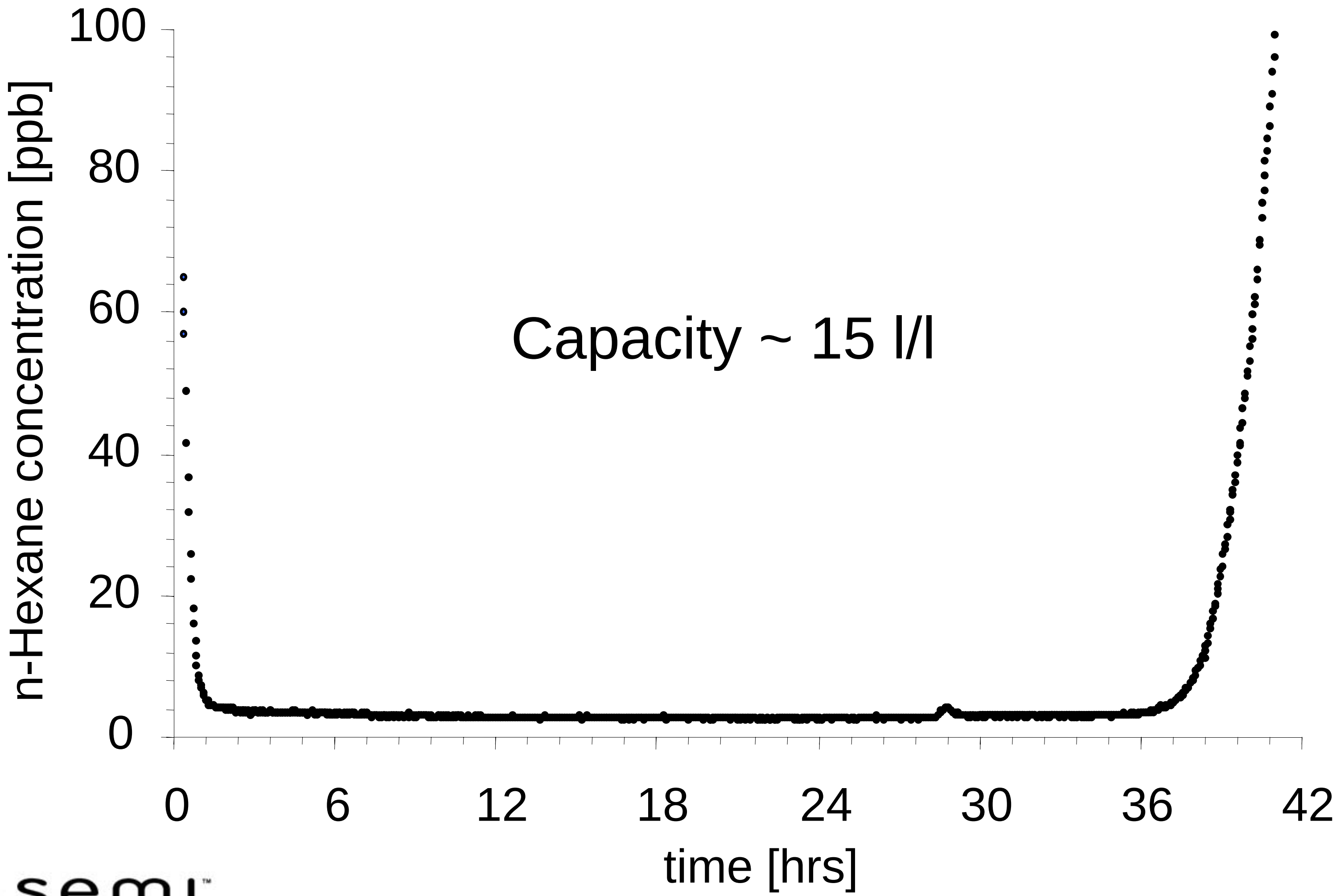
(N_2 matrix, APIMS)



semi
Semiconductor Equipment and Materials International

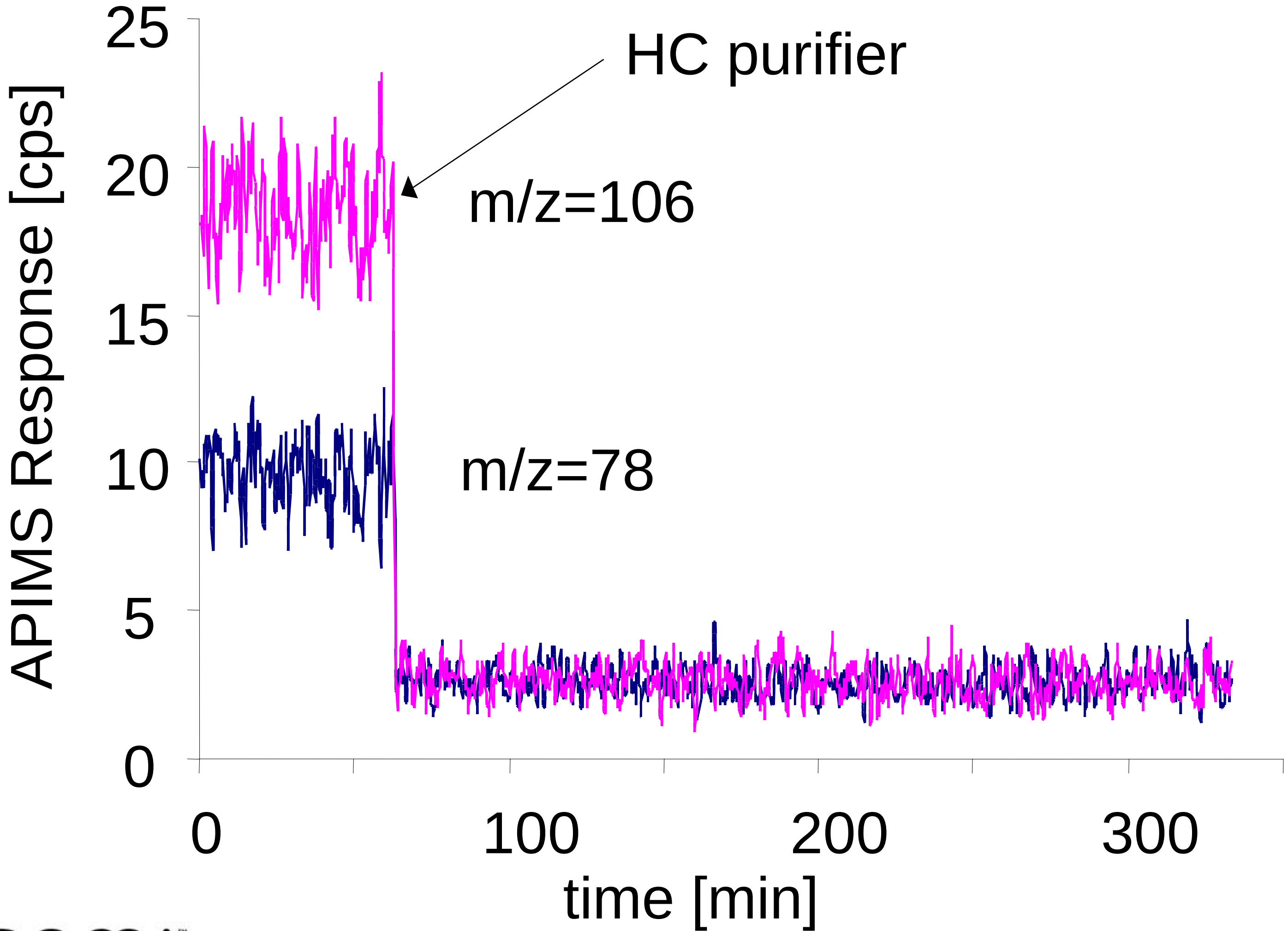
n-Hexane Removal Capacity

(86 ppm Challenge, N_2 matrix, APIMS)



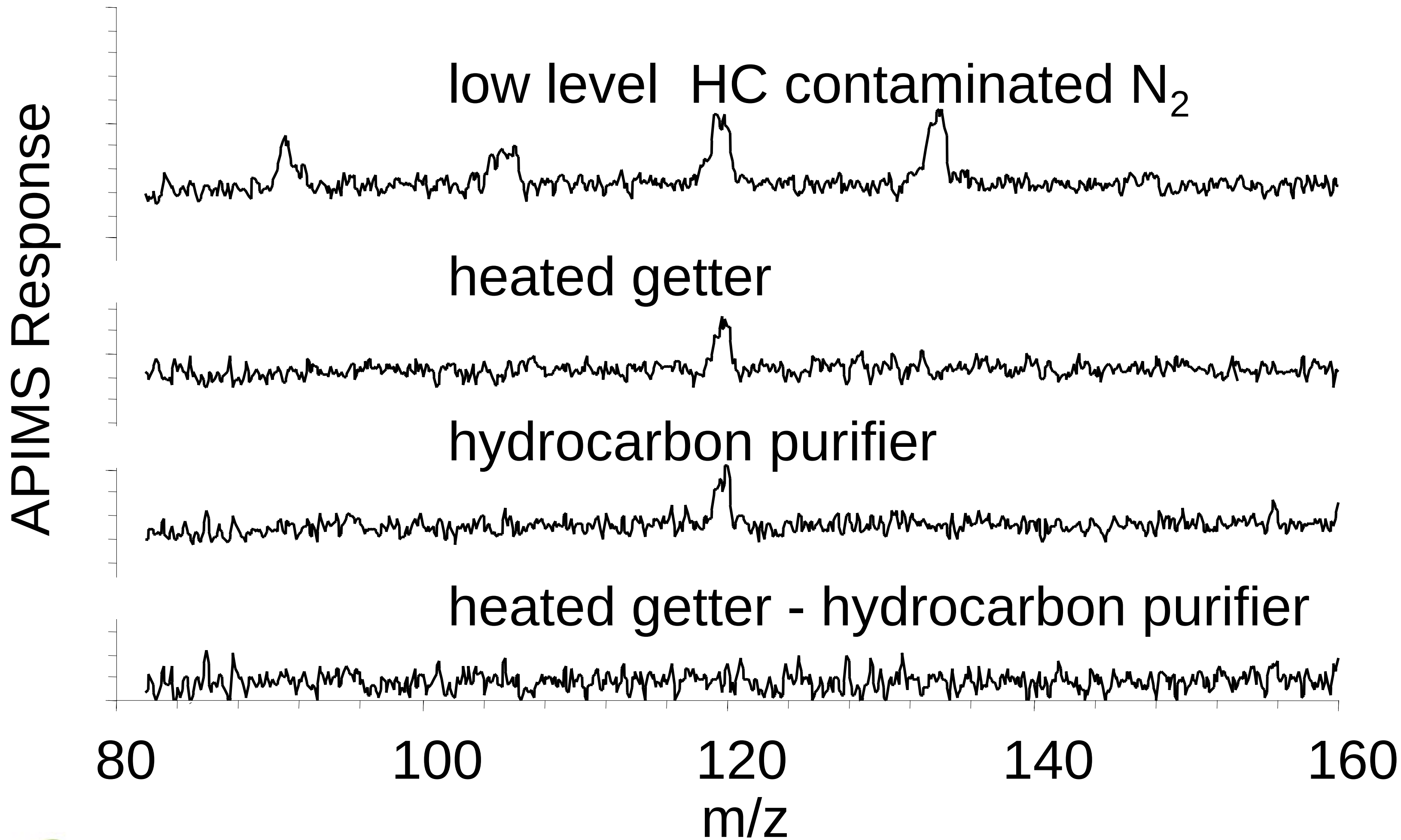
semi
Semiconductor Equipment and Materials International

Aromatics Removal from Contaminated N_2 Stream

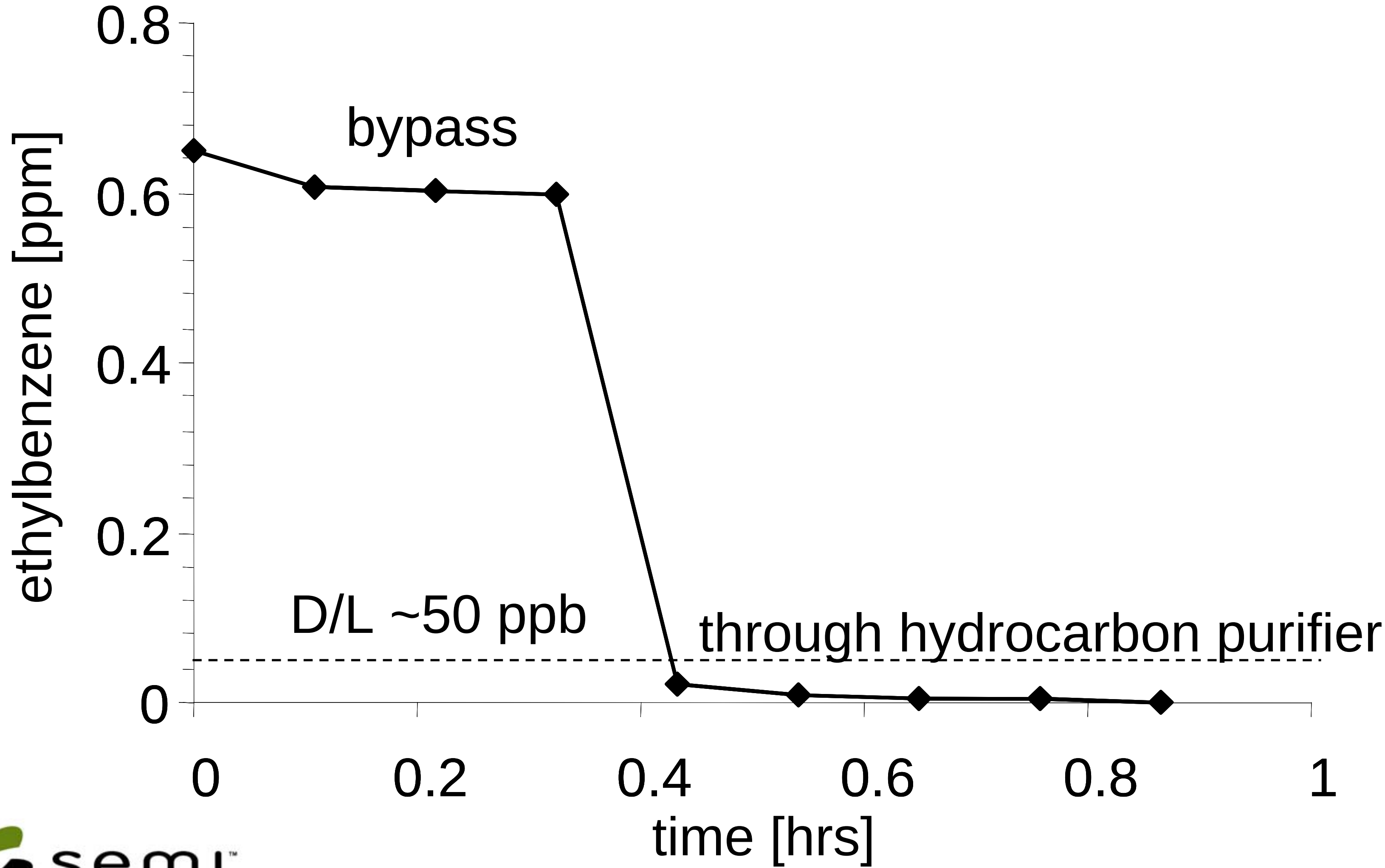


APIMS Spectra Comparison:

New HC Purifier vs. Heated Getter

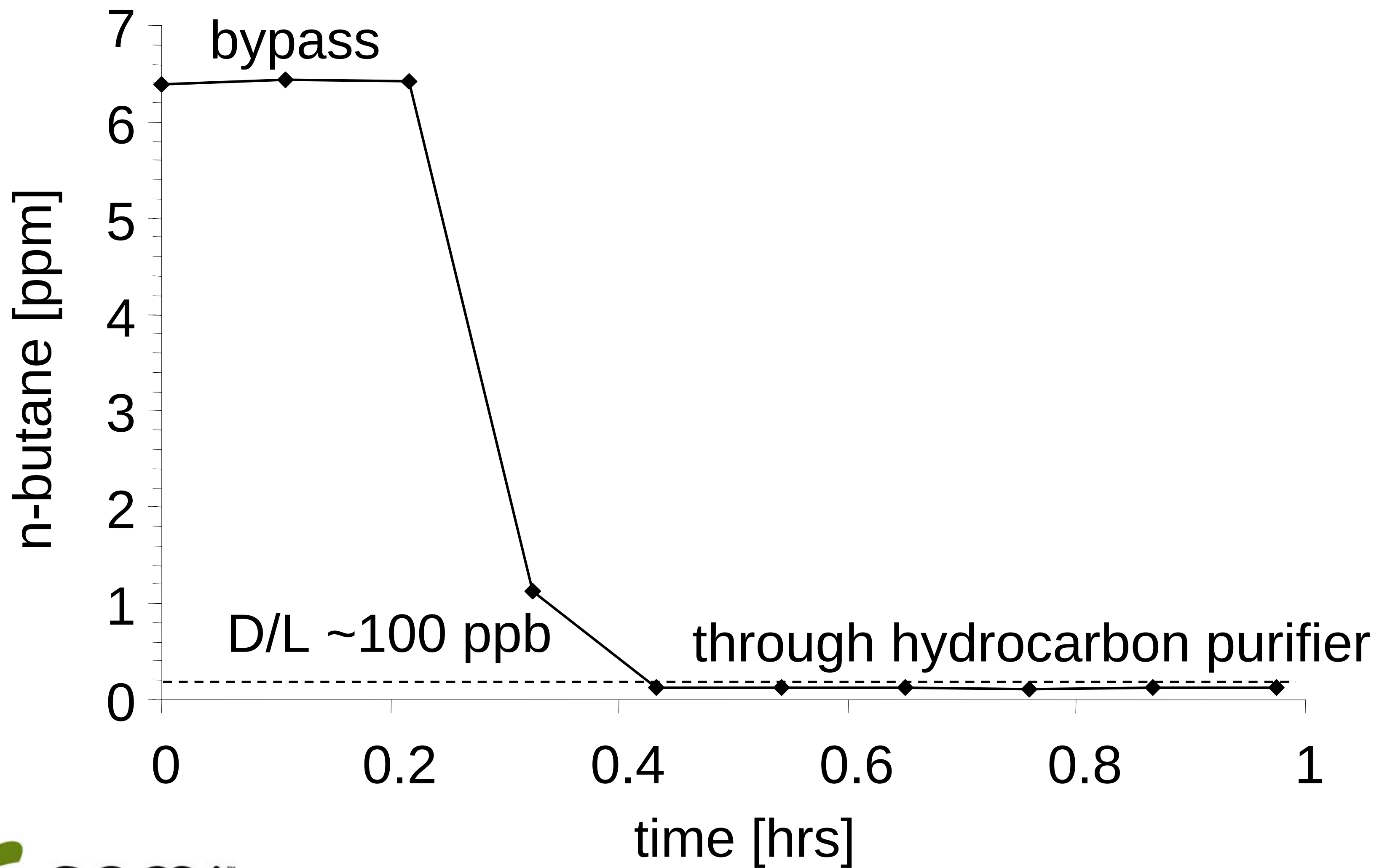


Ethylbenzene Removal from NH_3 (FTIR)



semi
Semiconductor Equipment and Materials International

n-Butane Removal from NH_3 (FTIR)



semi
Semiconductor Equipment and Materials International

Summary

- new inorganic NM-hydrocarbon purifier
- inert and reactive process gases
- high surface area - high capacity (15 l/l C_6)
- operates at room temperature
- stand-alone or combined w/ other materials
- high efficiency verified for C_4 and C_6