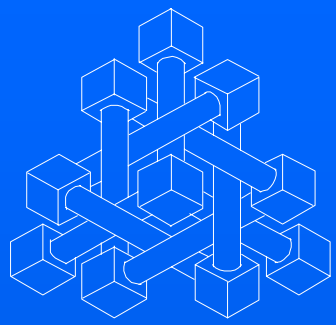


SOUTHERN RESEARCH

INSTITUTE

Hg Oxidation Compared for Three Different Commercial SCR Catalysts

Thomas K. Gale, George A. Blankenship, and W. Scott Hinton
Southern Research Institute
Jared W. Cannon, Southern Company
Bruce W. Lani, U.S. Department of Energy

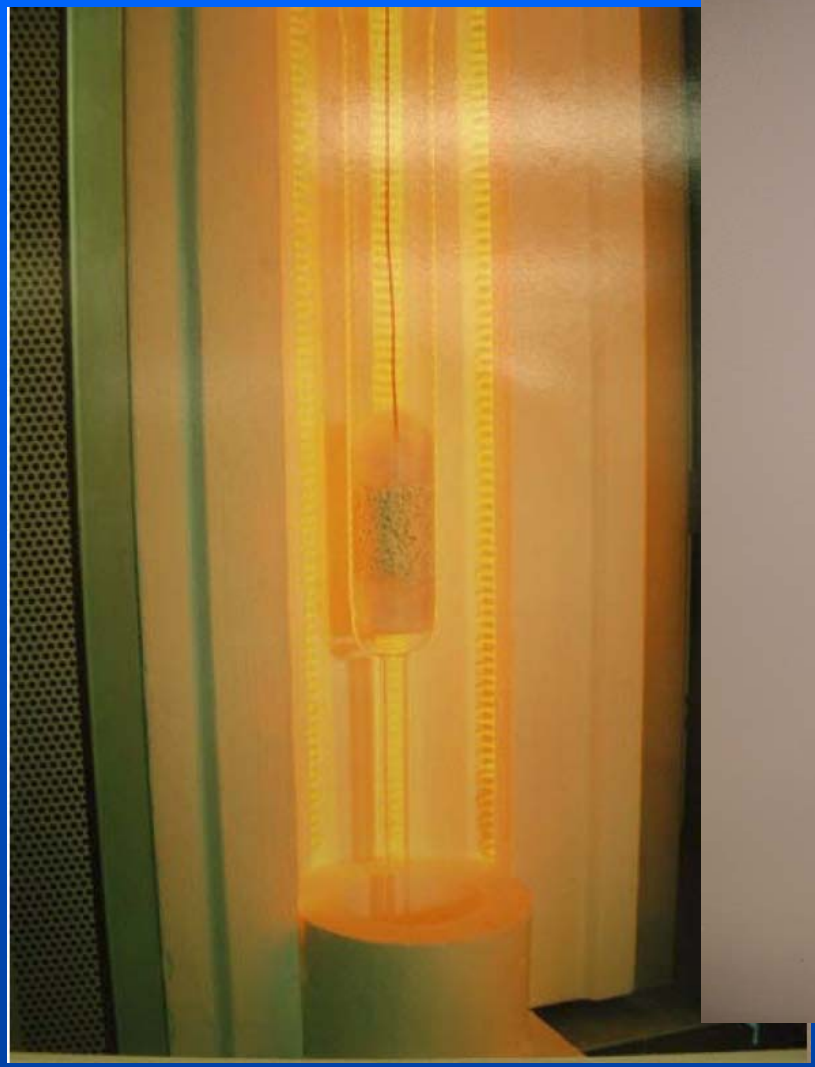
Acknowledgements

- This project was funded by US Department of Energy National Energy Technology Laboratory's Innovations for Existing Plants Program.
- Through cooperative agreement number DE-FC26-04NT41900.
- We would also like to thank Haldor Topsoe Inc., Cormetec Inc., and Hitachi Corp. for supplying samples of their commercial catalysts for this comparison.

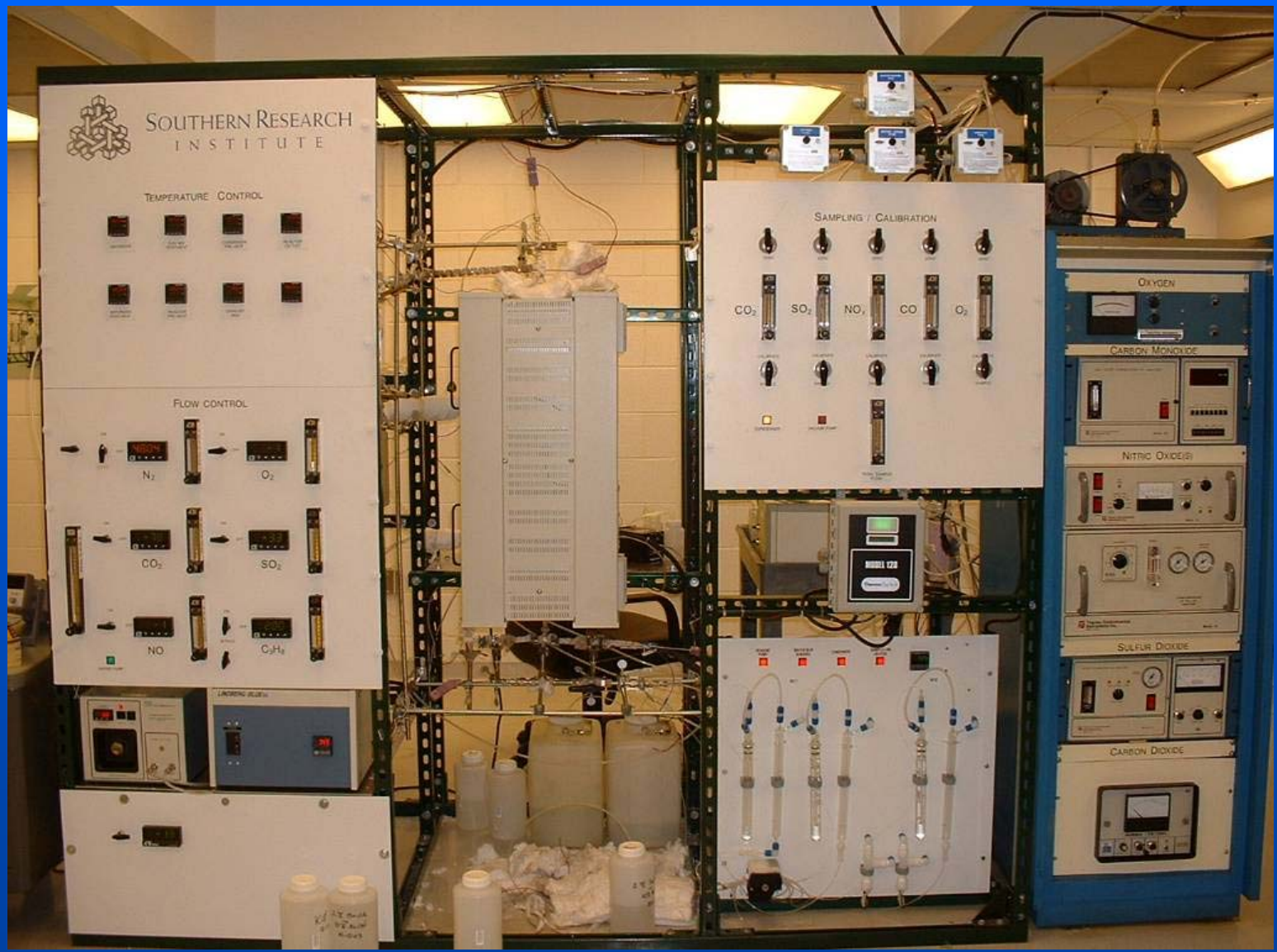
Outline

- Experimental
  - Furnace and Reactor
  - Catalyst Test Facility
  - Commercial Catalysts
  - Basis for Comparison
  - Test Conditions
- Hg Oxidation as a Function of:
  - HCl / NH_3 / Temperature
- SO_3 Formation Comparison
- Conclusions

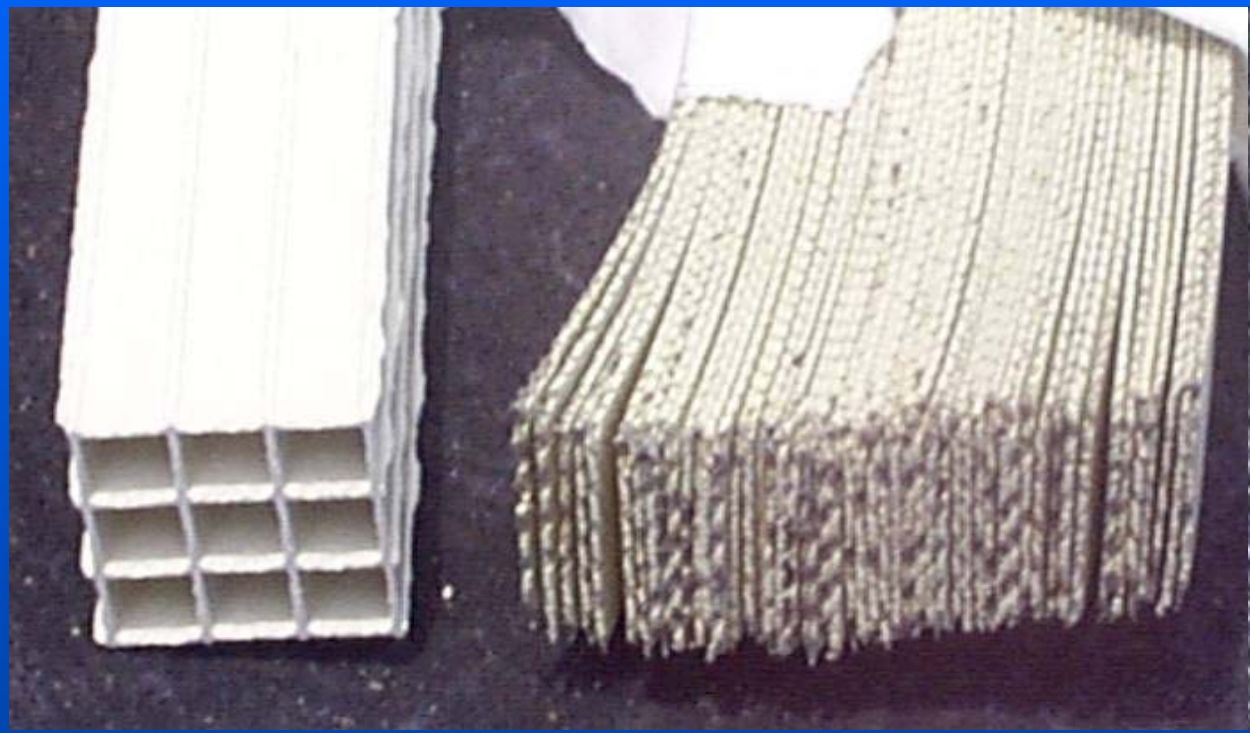
Furnace and Reactor



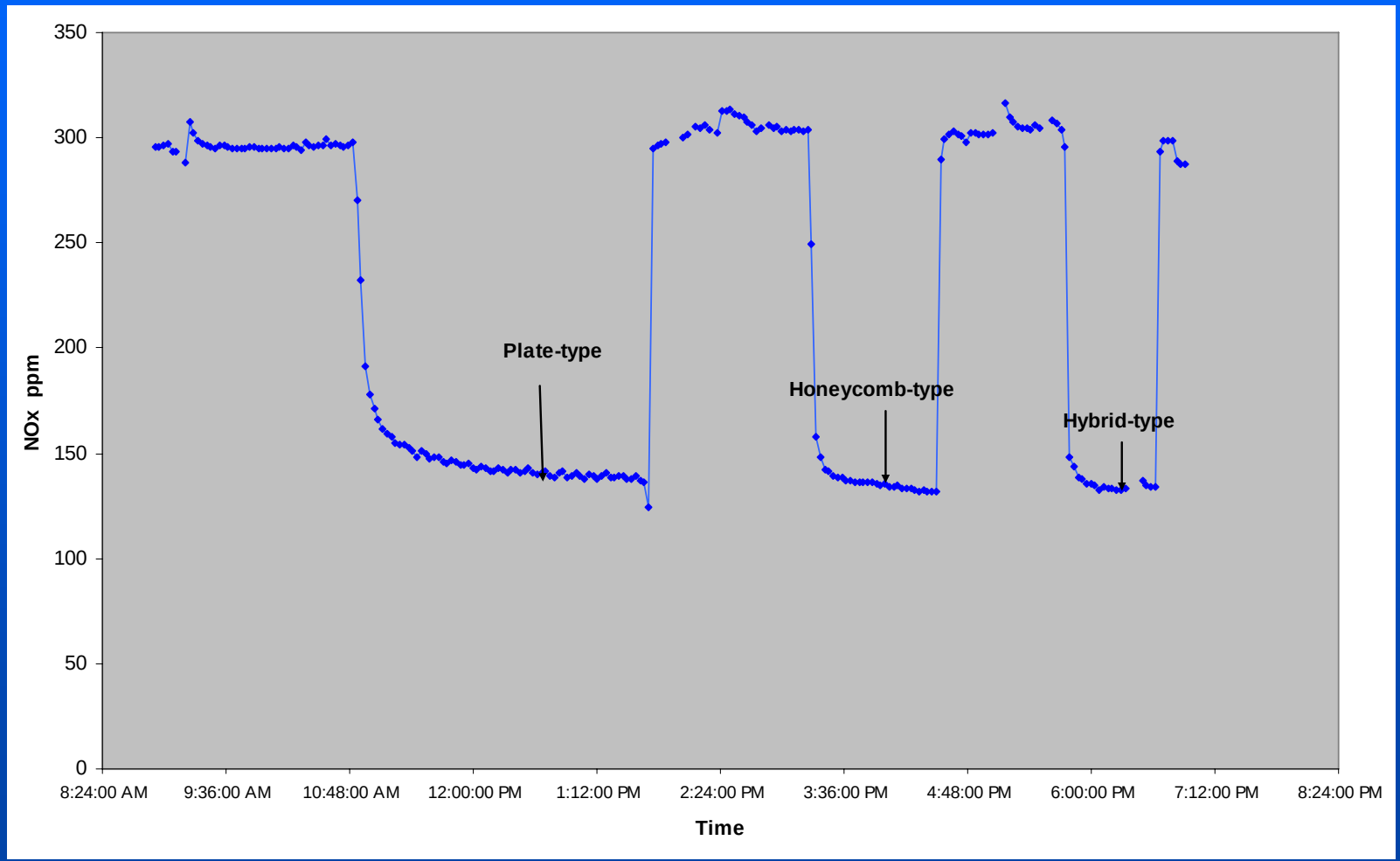
Catalyst Test Facility



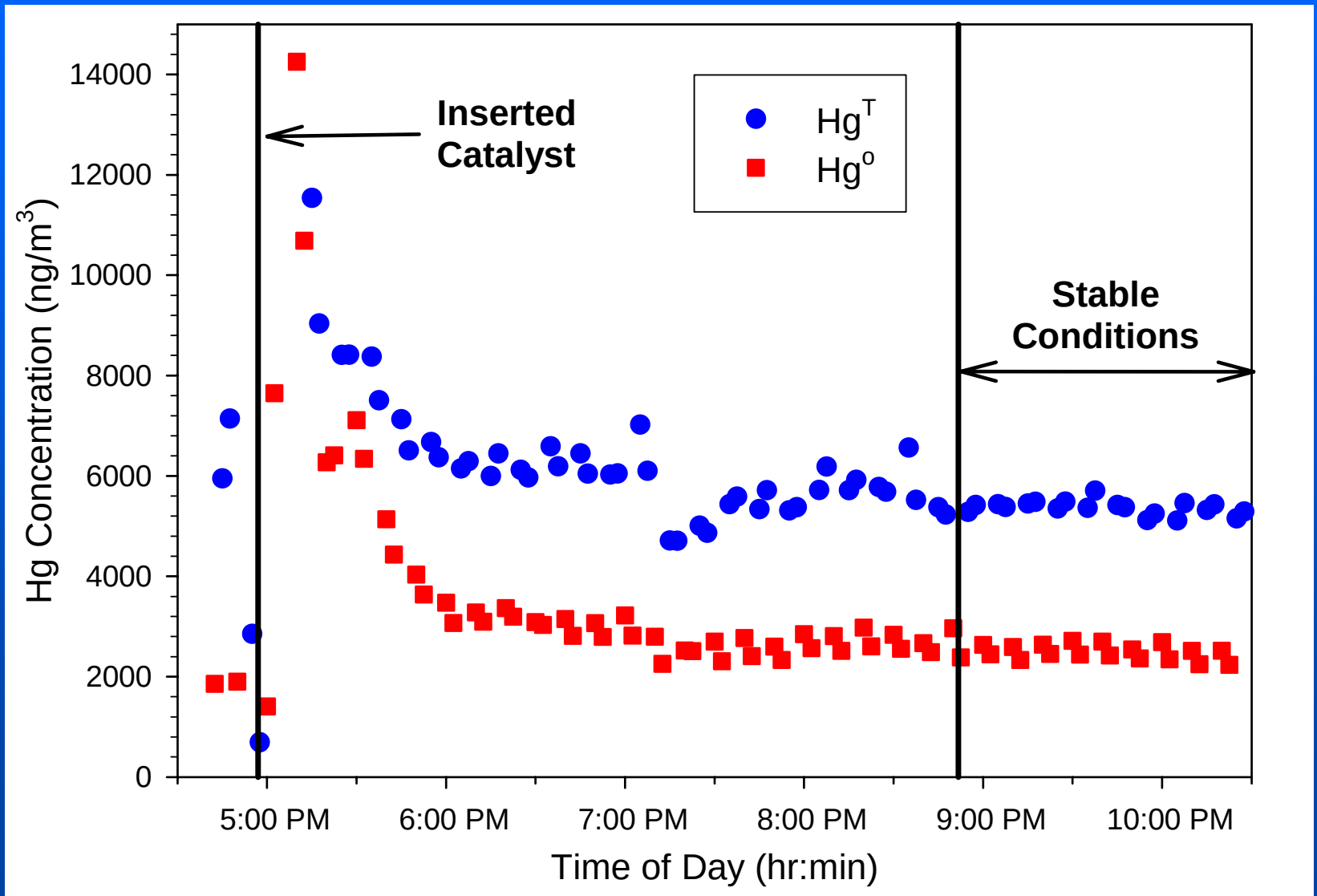
Honeycomb, Plate, and Hybrid Commercial Catalysts



Basis for Comparison



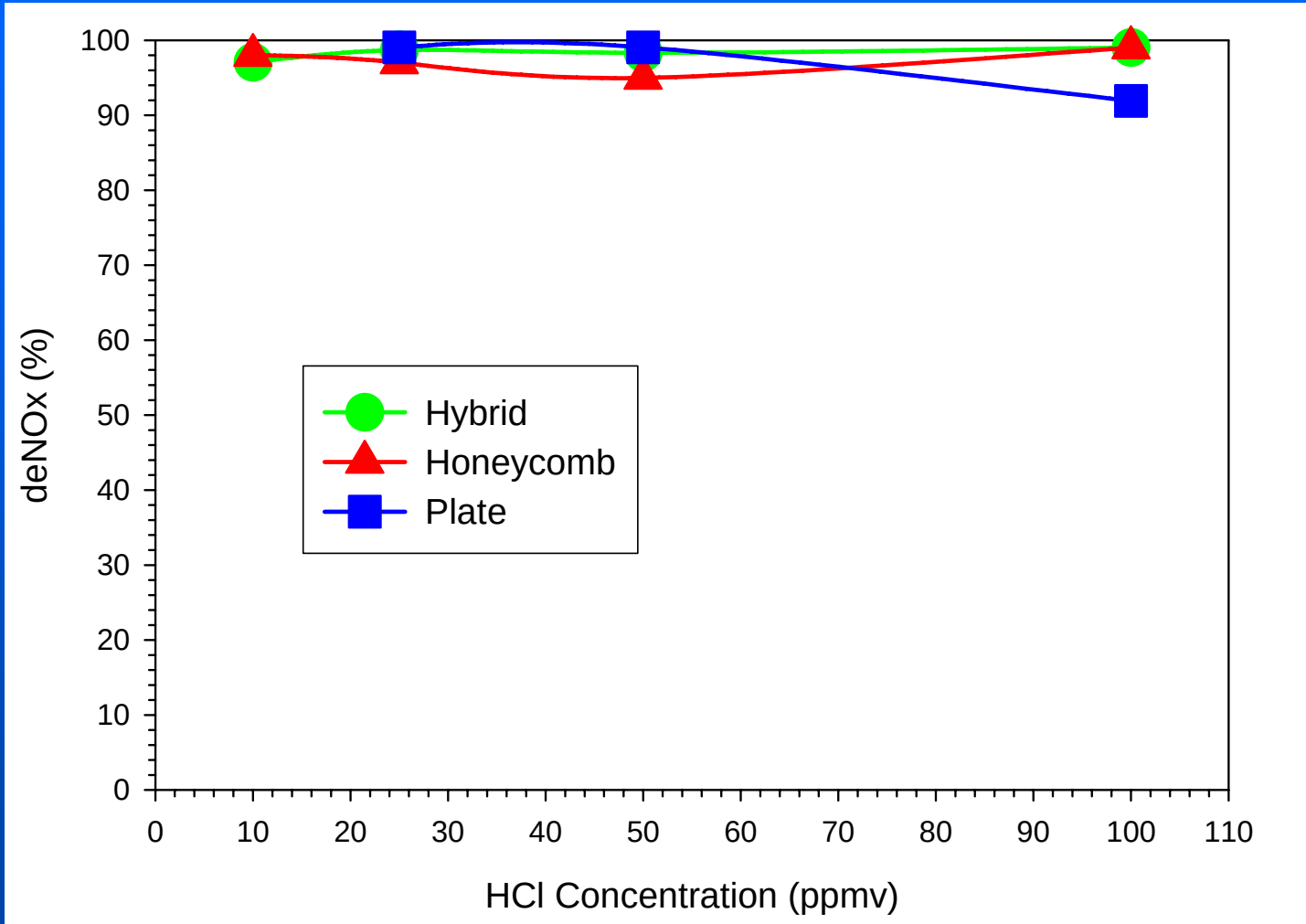
Time to Steady State



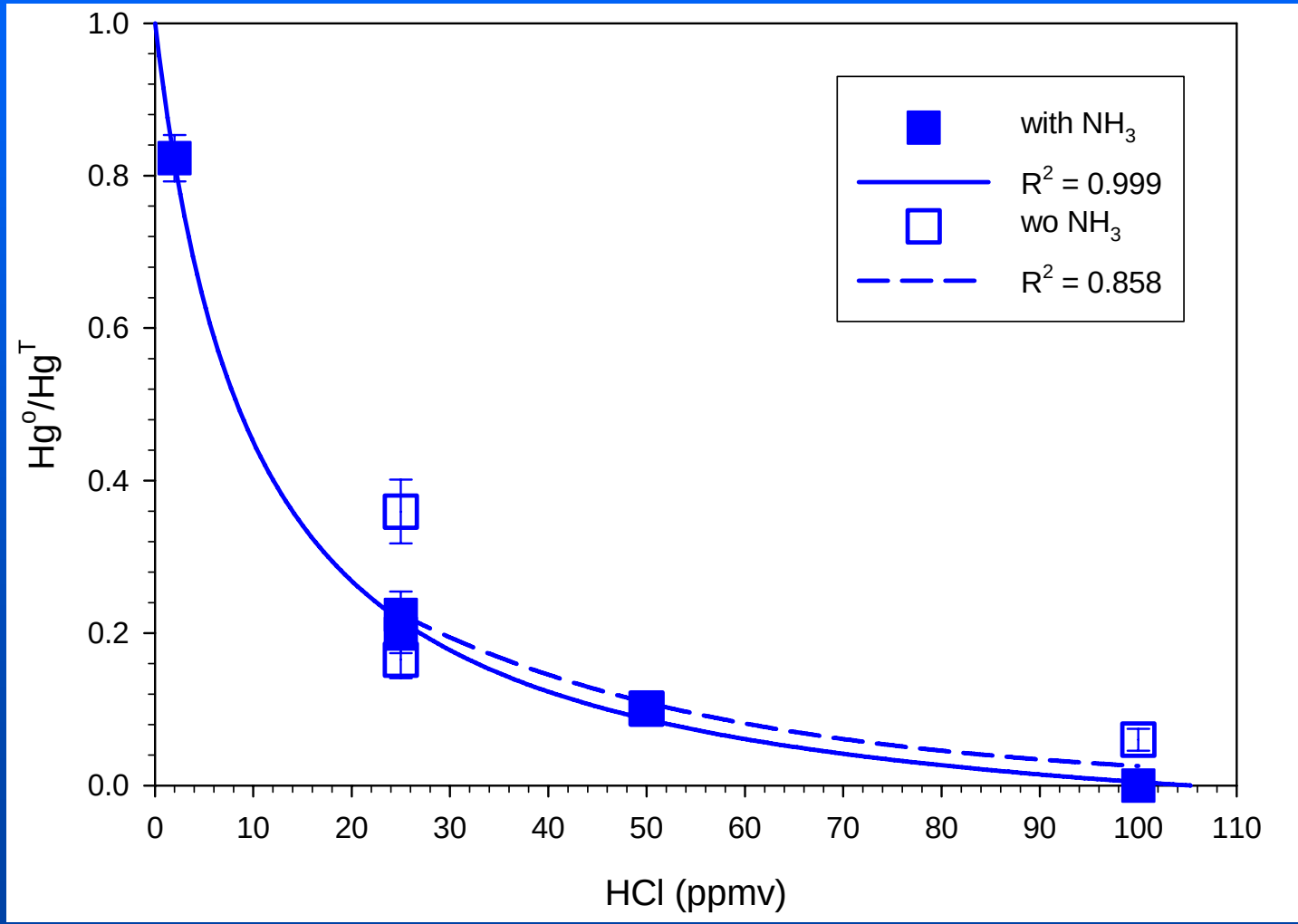
Test Conditions

Parameter	Range for Test Campaign
Temperature	650 to 800 °F
Flow Rate	~7.5 slpm
$deNO_x$	>95% $deNO_x$ at a ratio of $NH_3/NO = 1$
Gas Concentrations (dry basis, other than H_2O)	
N_2	~72% by volume
O_2	~5 % by volume
CO_2	~15% by volume
NO	300 ppmv
NH_3	0.0 ppmv or 300 ppmv
SO_2	500 ppmv or 1000 ppmv
HCl	2 to 100 ppmv
H_2O	~8% by volume
Hg°	10 $\mu g/m^3$

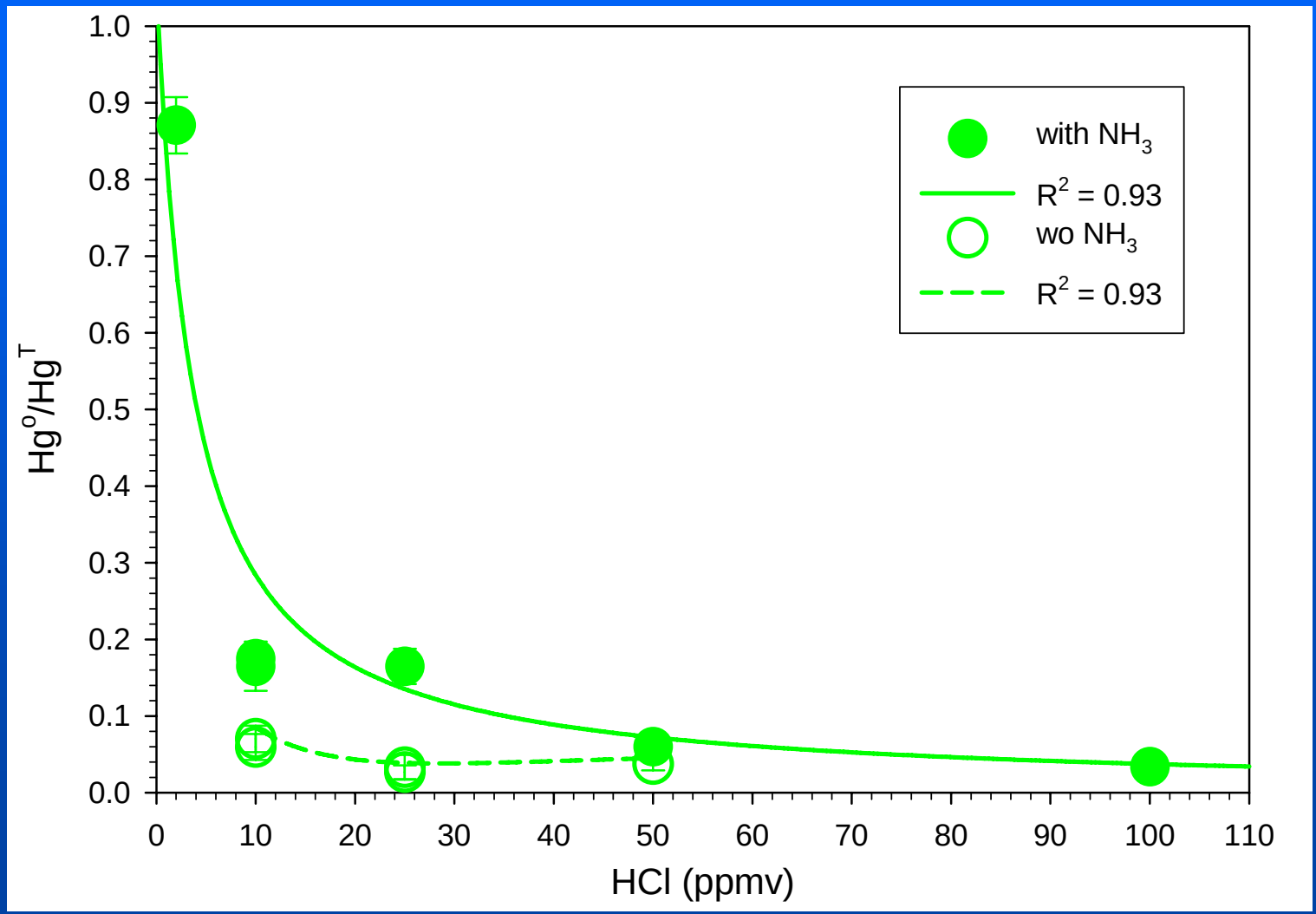
$DeNO_x$ vs HCL Concentration



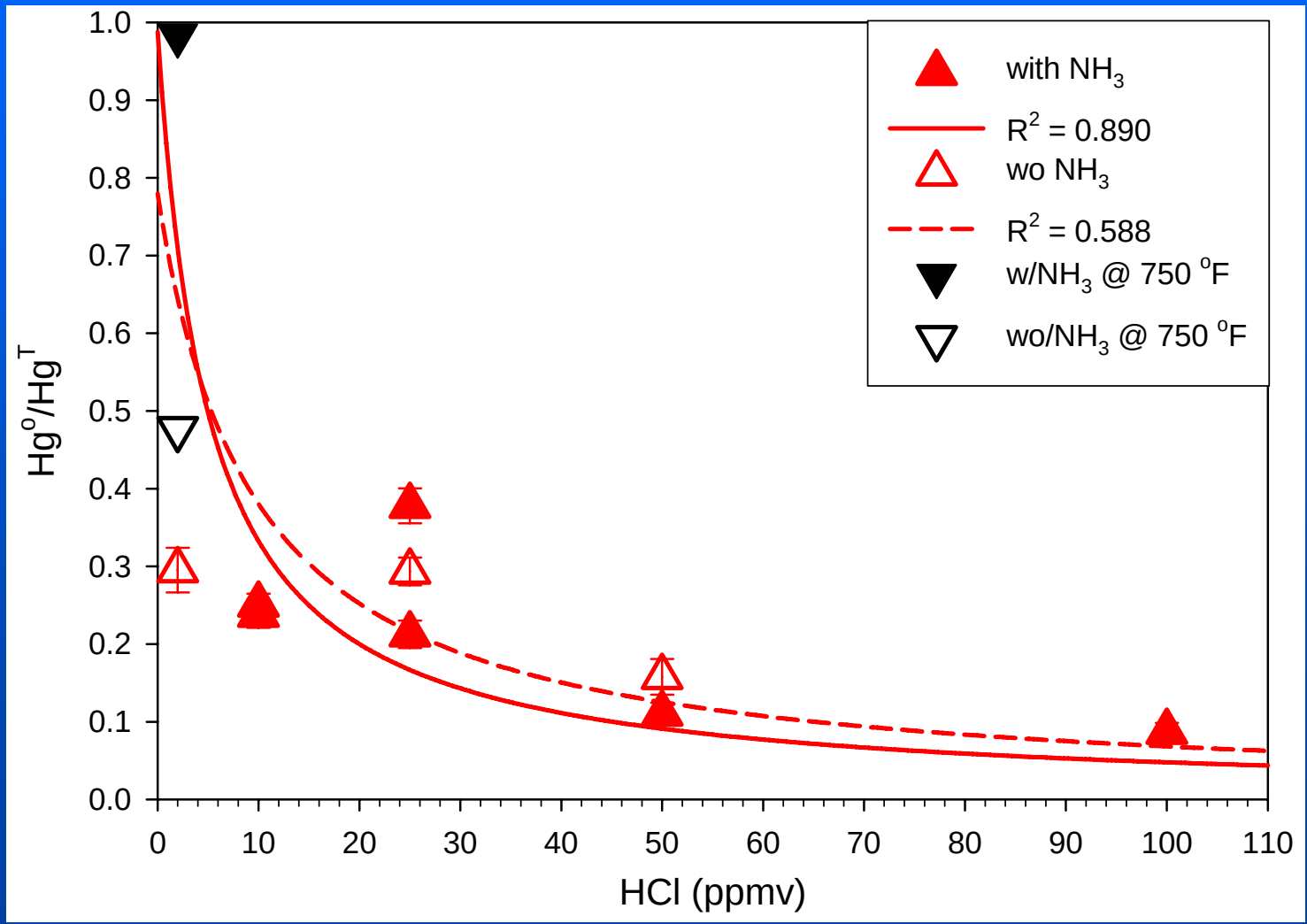
Hg Oxidation Across Plate Catalyst at 700 ºF



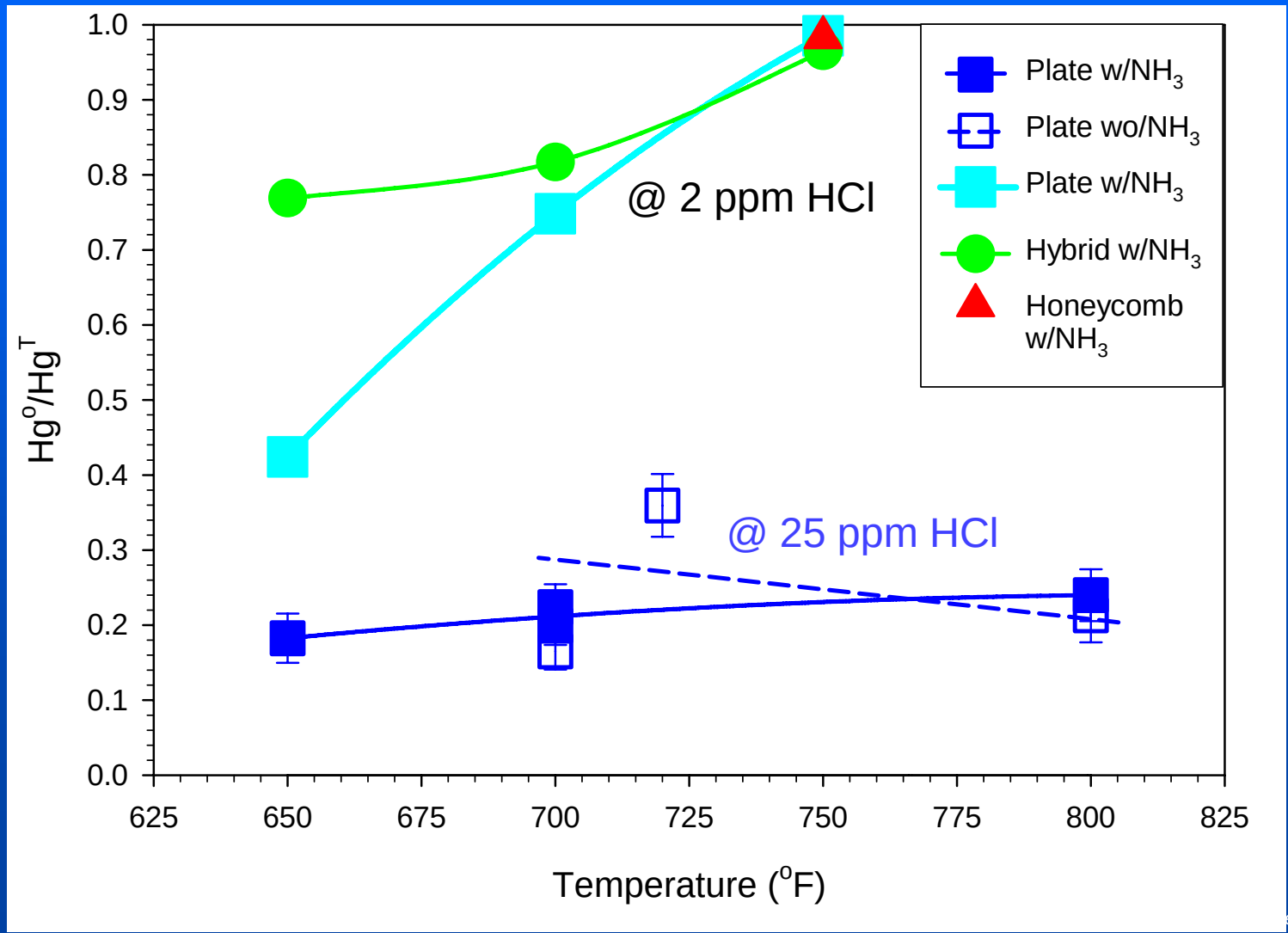
Hg Oxidation Across Hybrid Catalyst at 700 ºF



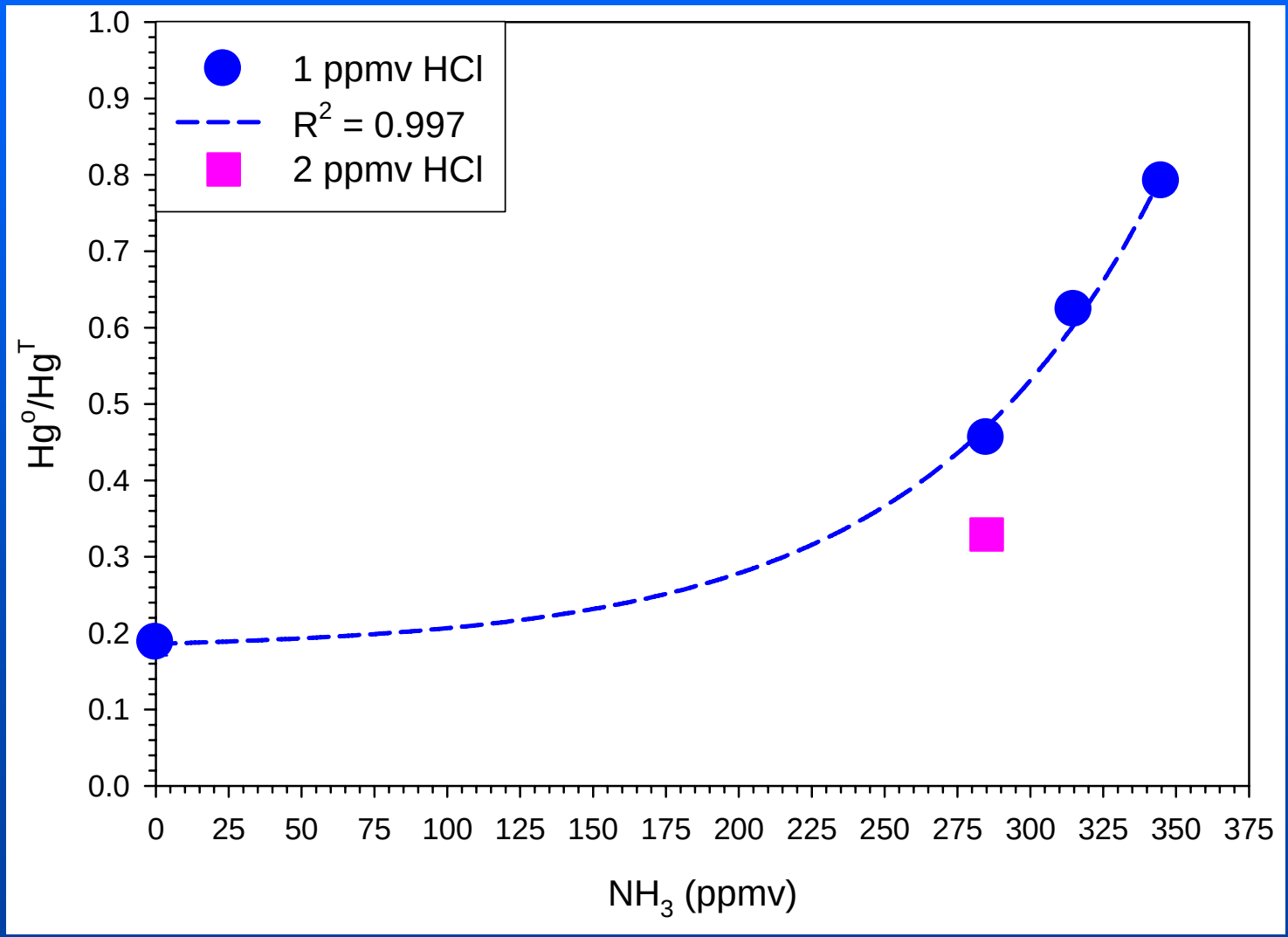
Hg Oxid. Across Honeycomb Catalyst at 700 °F



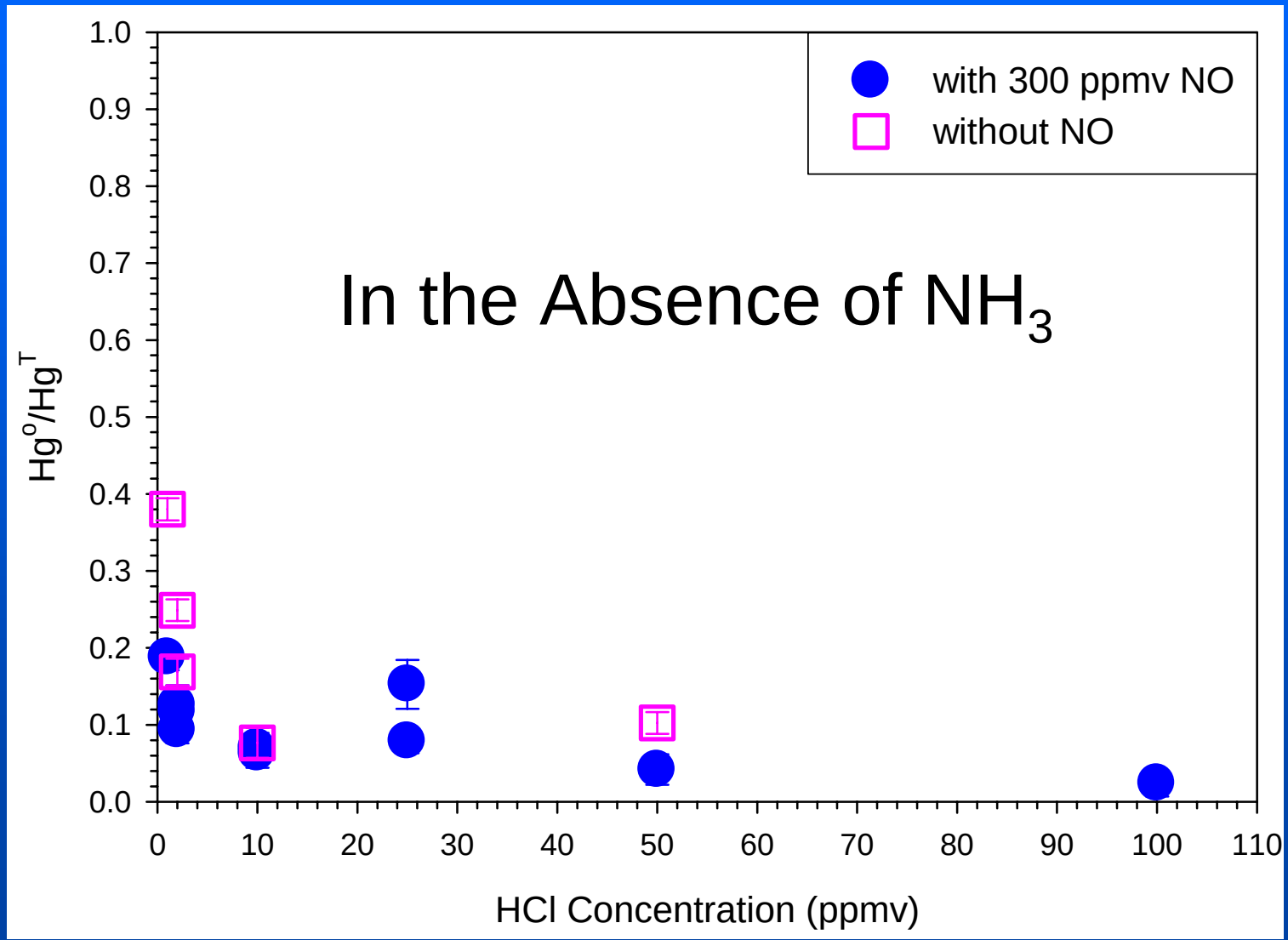
Temperature dependence of mercury oxidation



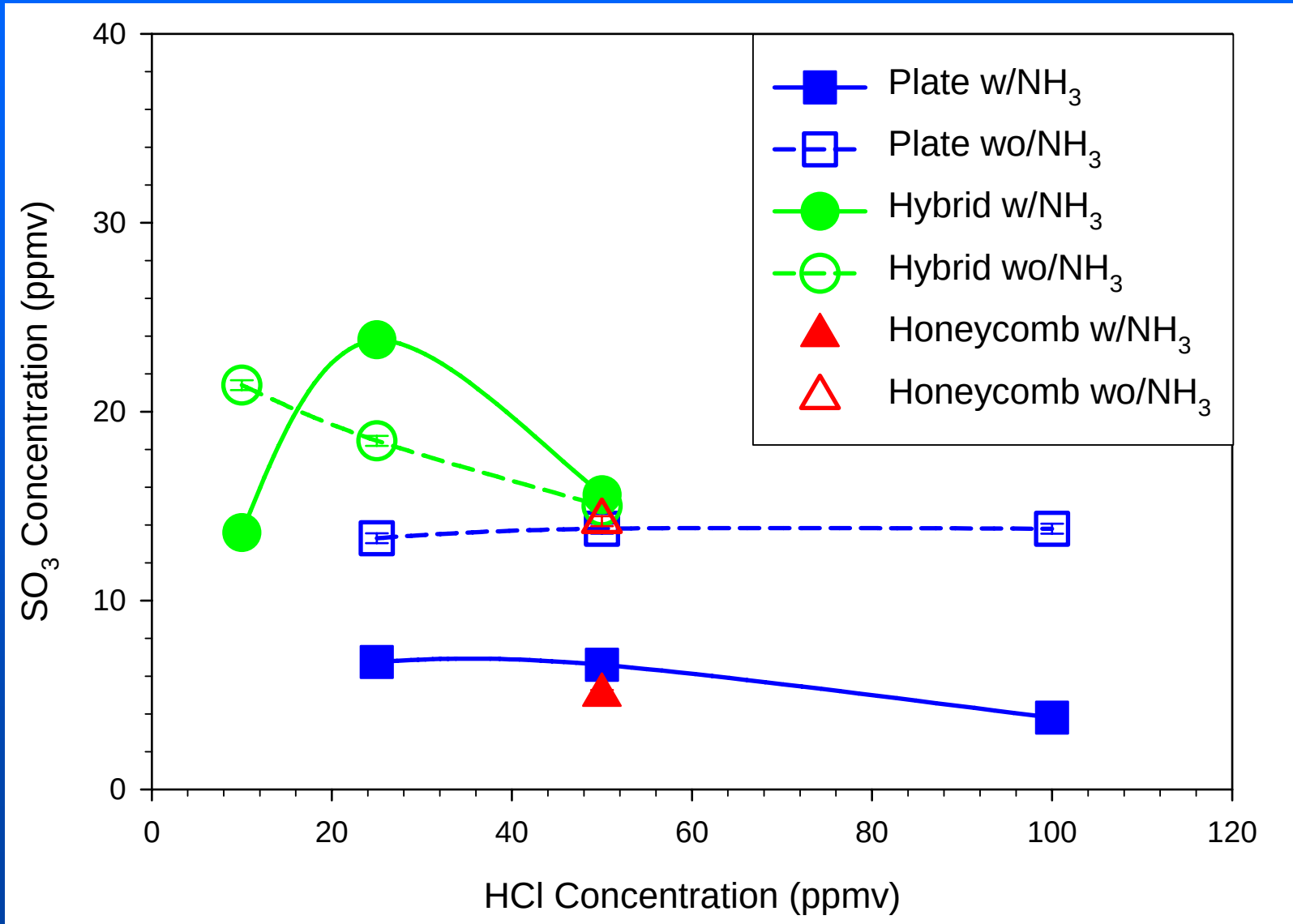
Effect of Ammonia in the Presence of 300 ppmv NO



Effect of NO on Hg Oxidation



Comparison of SO_3 Formation



Conclusions

- All three catalysts performed similarly for mercury oxidation and SO_2/SO_3 conversion.
- NH_3 may inhibit Hg oxidation at Power Plants with very little HCl in the flue gas.
- NH_3 had little effect with higher HCL levels.
- Absence of NH_3 allowed significantly more SO_2/SO_3 conversion, independent of HCl.
- Increased mercury oxidation can be obtained across an SCR catalyst by increasing HCl concentrations, regardless of temperature, catalyst type, or the presence of ammonia, and without increasing SO_2/SO_3 conversion.