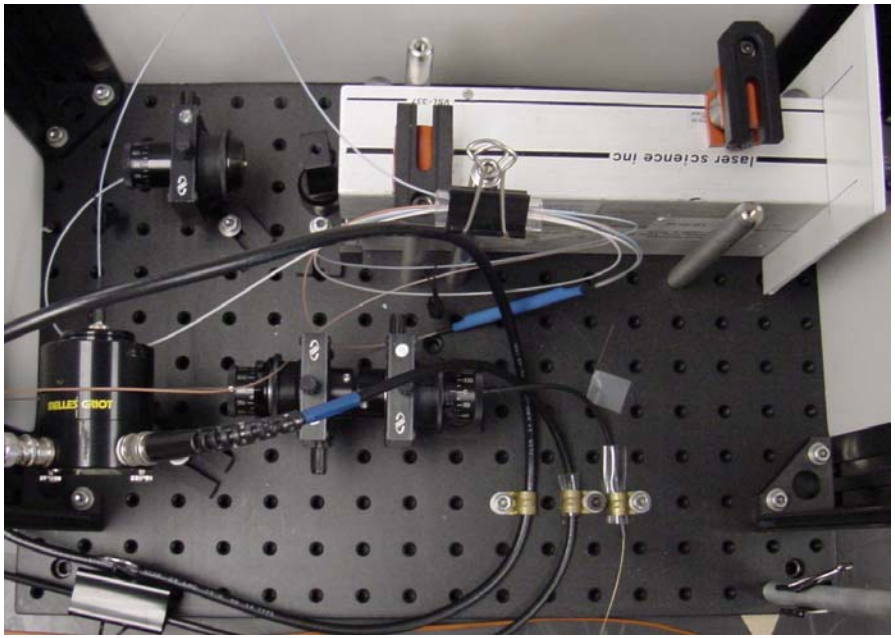
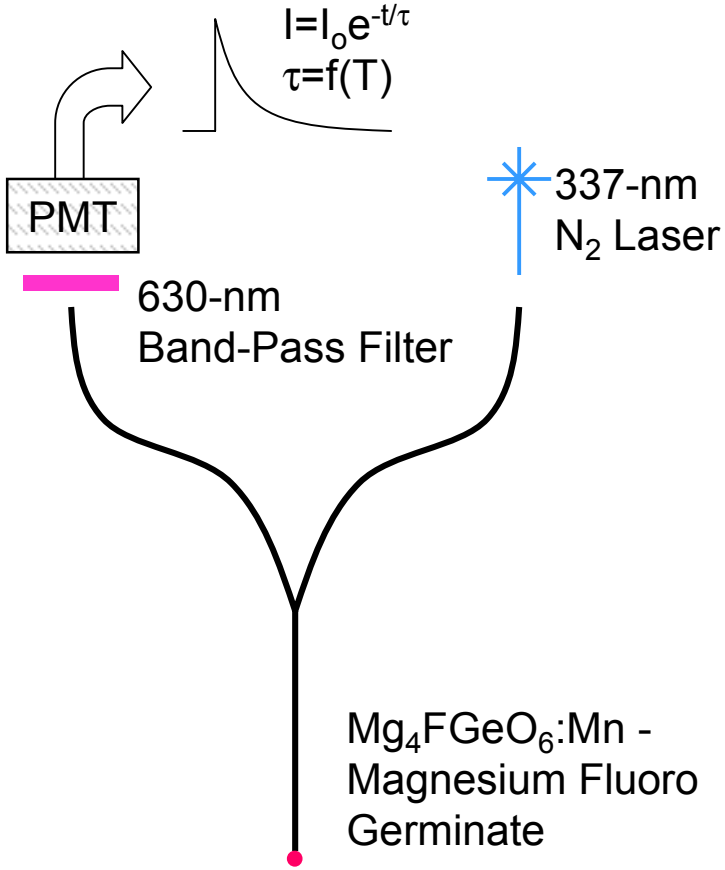
Phosphor Thermography : An Instrument for Resolving Catalyst Temperature Transients



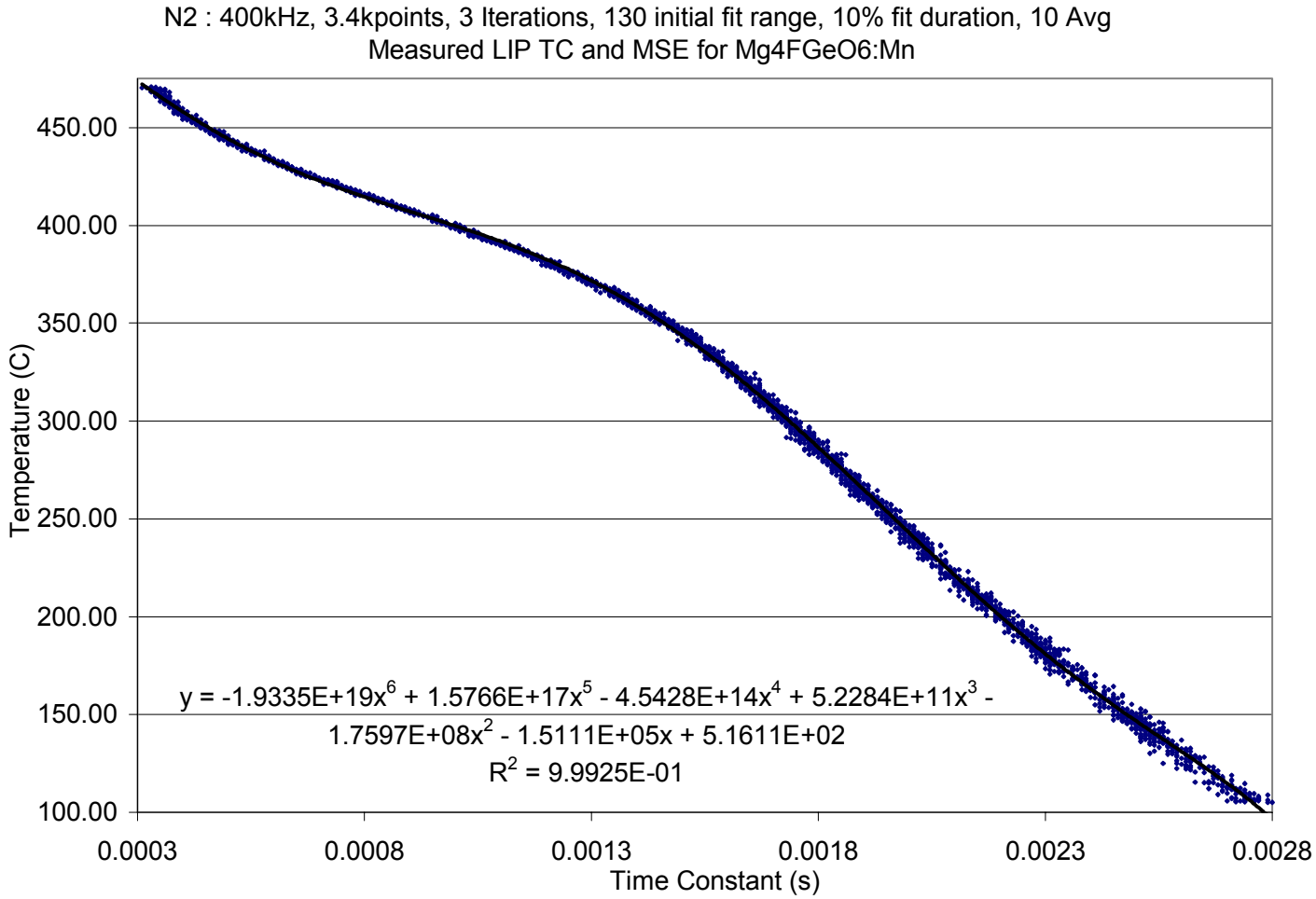


Fast ~ 2Hz rep. Rate

Minimally Invasive : based on ~200-μm OD optical fiber

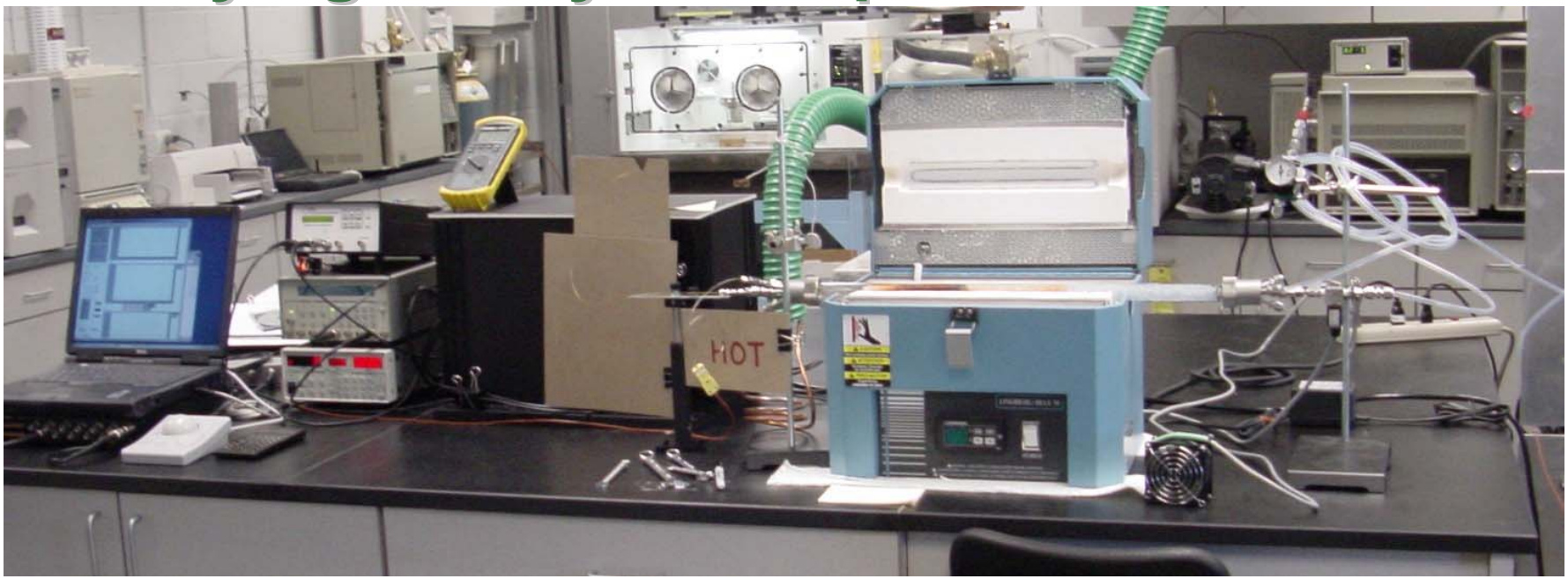
Transportable : 1-ft x 2-ft breadboard, 110Vac

Phosphorescence Time Constant varies with Temperature



τ decreases with increasing temperature

Phosphor Thermography Setup for Quantifying Catalyst Temperature Transients



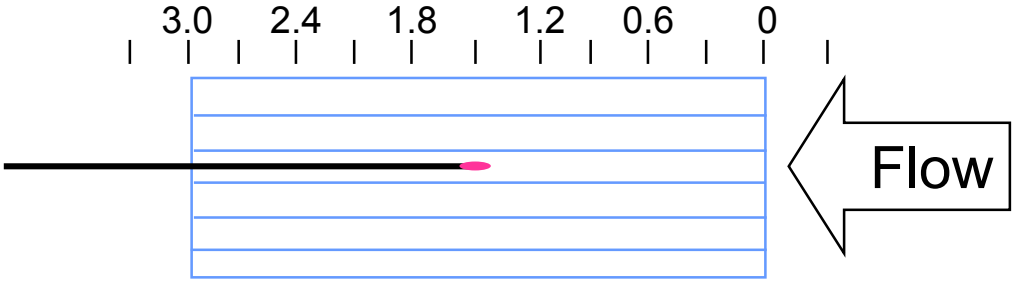
Catalyst : EmeraChem NOx Adsorber, 200 cpsi, 3-in long, 1-in OD

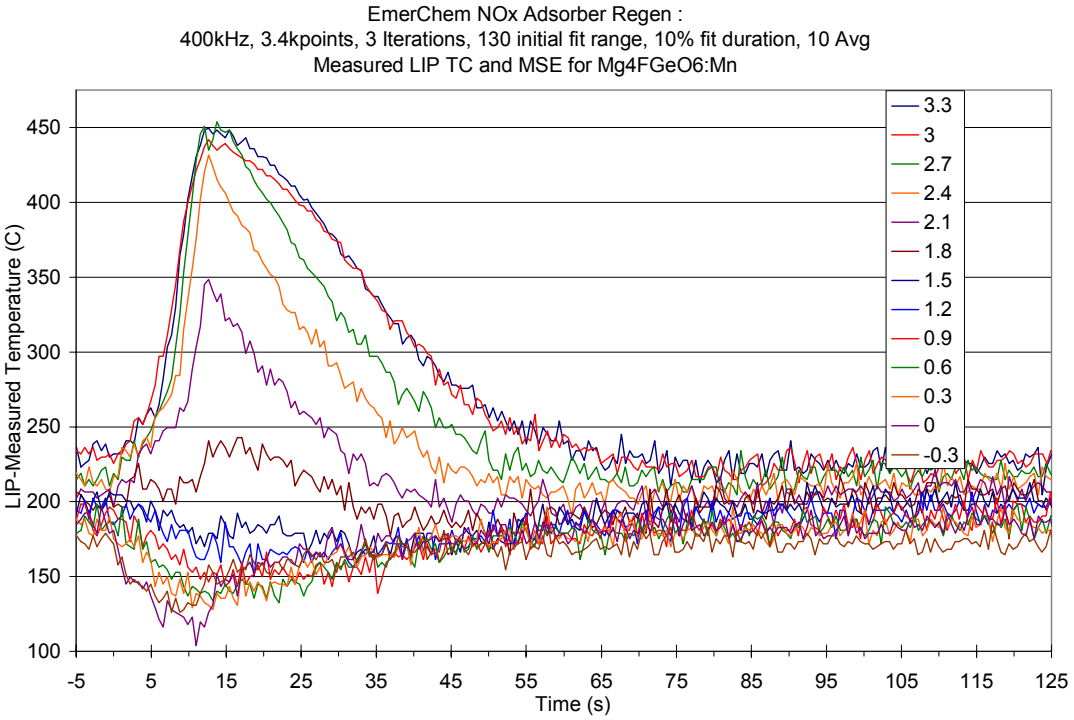
Base Flow : ~11% O2 in N2 at 25k Exchanges/hr

Reductant : 9.98% Ethylene, 0.21% N2, CO balance

‘Regeneration’ Schedule : 12-s pulse, 125-s period

Phosphor Thermography Instrument Resolves to Intra-Catalyst Temperature Transients





Degraded SNR due to damaged phosphor

Reductant has ~50C cooling effect on catalyst front

Gradual heating from monolith HT in front half of catalyst

Light off occurs in back inch of catalyst