Hydrothermally Stable, Sulfur-Tolerant Platinum-based Oxidation Catalysts via Surface Modification of SiO$_2$ with TiO$_2$ and ZrO$_2$

Mi-Young Kim, Jae-Soon Choi, Todd J. Toops
Viviane Schwartz
Oak Ridge National Laboratory, USA

Eun-Suk Jeong, Sang-Wook Han
Chonbuk National University, Korea

18th DEER
Dearborn, Michigan
October 17, 2012
TiO$_2$ & ZrO$_2$ coating of SiO$_2$ can lead to Pt catalysts with enhanced performance

- TiO$_2$ and ZrO$_2$ coating enhances dispersion & redox capacity of Pt → excellent CO oxidation performance (lower light-off temp)
- TiO$_2$ and ZrO$_2$ coating generates surface acidity but low basicity → good sulfur tolerance
- TiO$_2$ and ZrO$_2$ coating enhances interaction between Pt & supports → excellent hydrothermal stability

---

**Graph:**
- Pt/Al
- Pt/Si
- Pt/Ti-Si
- Pt/Zr-Si

**Bar Chart:**
- Fresh
- Sulfated
- Aged

**Values:**
- Pt/Al: 100
- Pt/Si: 140
- Pt/Ti-Si: 180
- Pt/Zr-Si: 220

**Legend:**
- Strong interaction with Pt (+)
- Sulfur tolerant (+)
- Low surface area (-)

---

**Diagrams:**
- Monolayer coating via sol-gel chemistry
- Weak interaction with Pt (-)
- Higher surface area (+)
- Strong interaction with Pt (+)
- Sulfur tolerant (+)
- Higher surface area (+)