

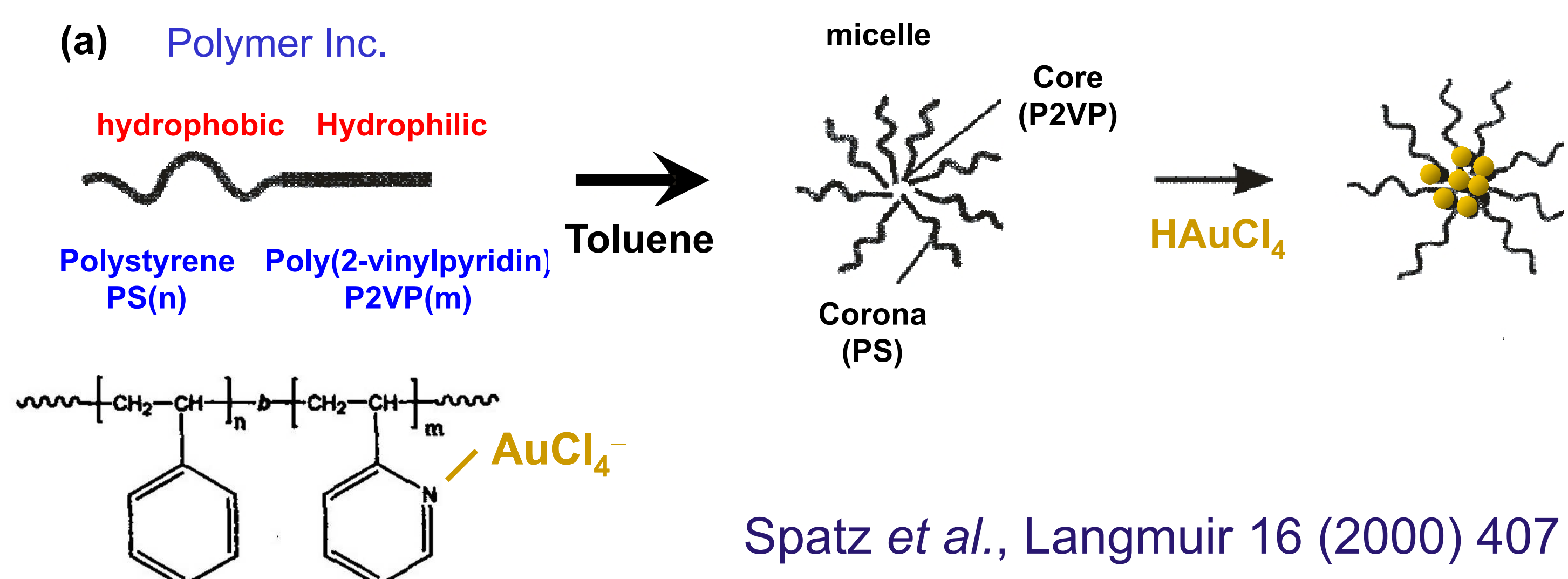
In-situ gas phase catalytic properties of size selected gold nanoparticles



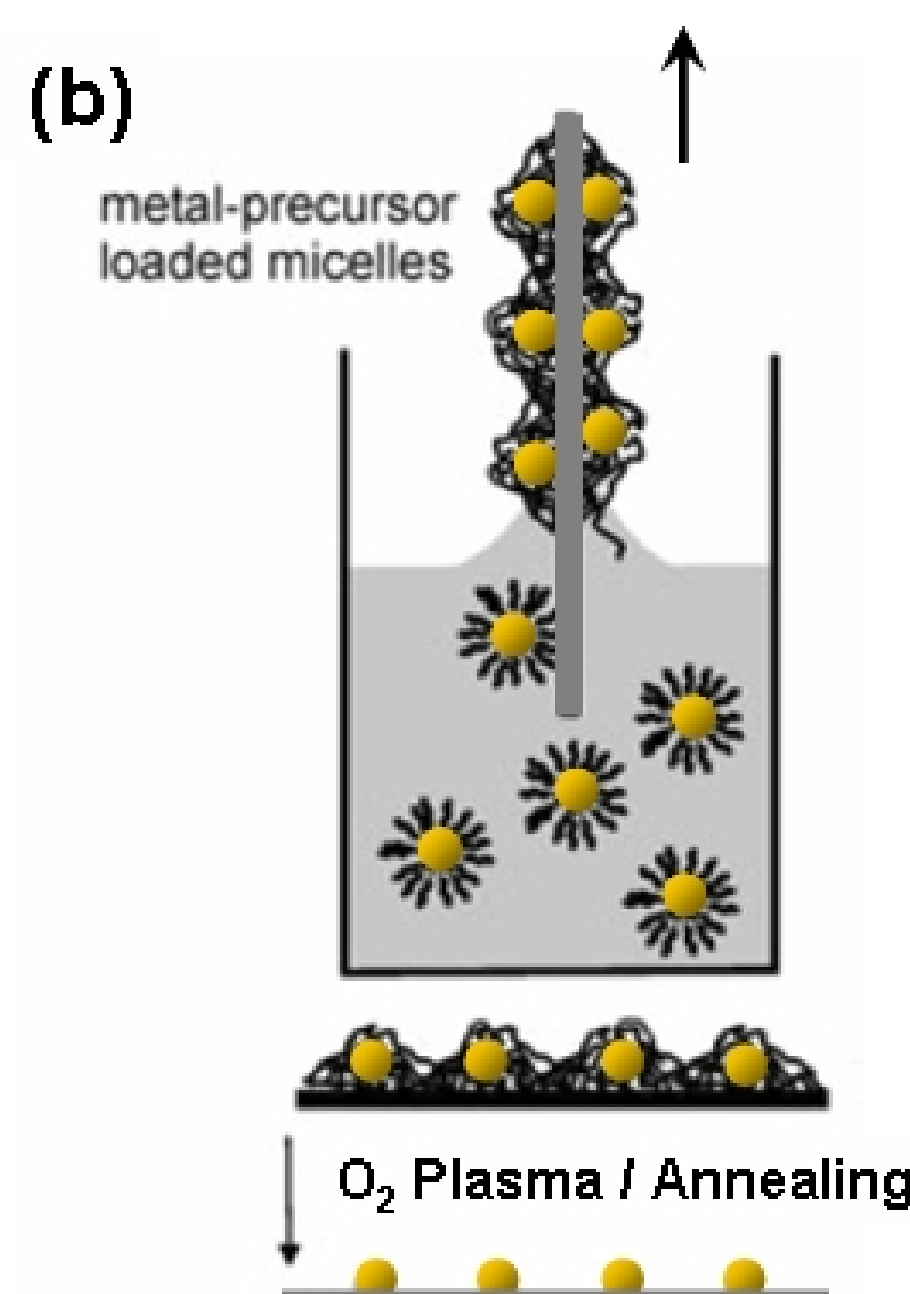
Luis K. Ono, Beatriz Roldan Cuenya
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1. Nanoparticle Synthesis/Characterization

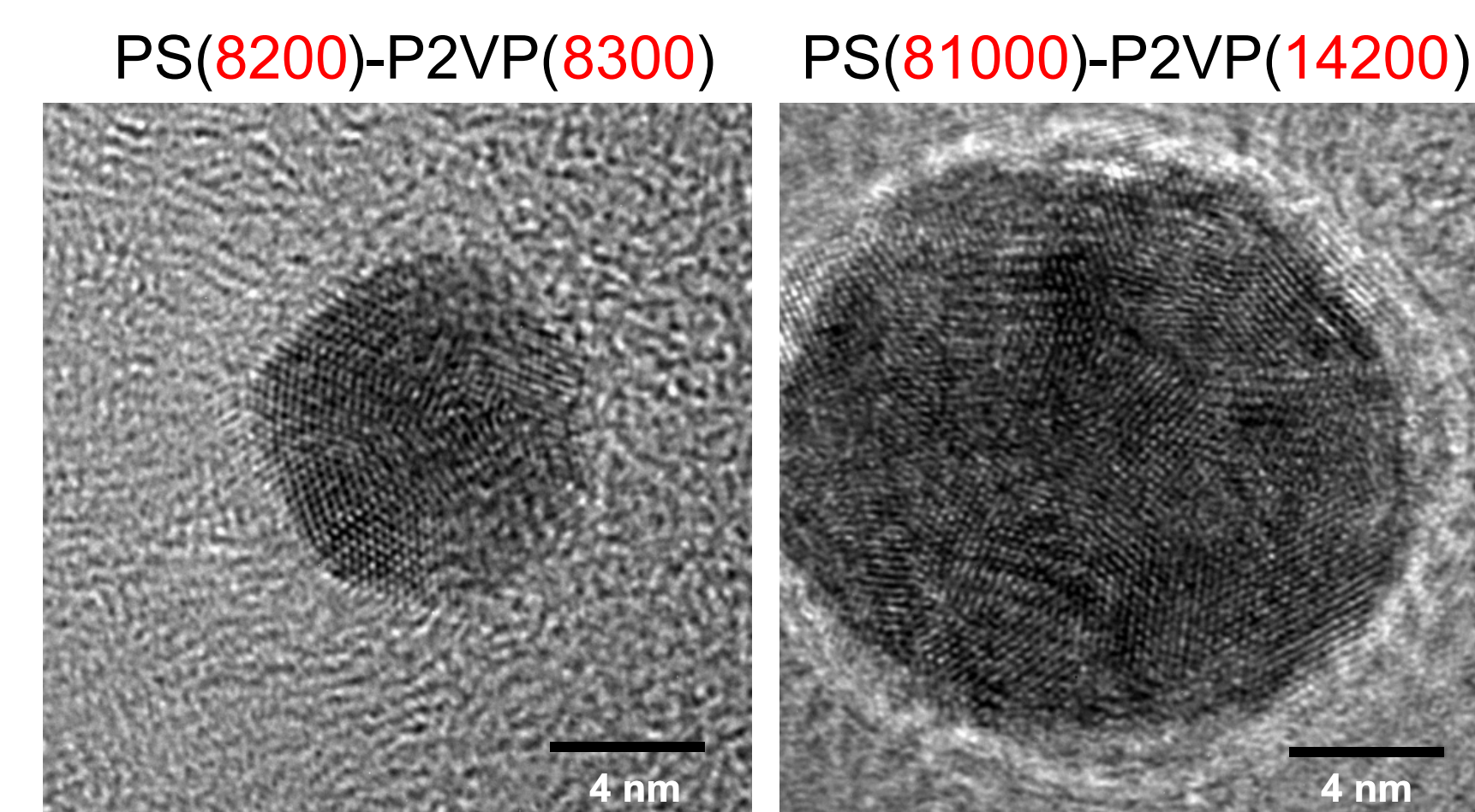
Micelle Encapsulation : Truncated Spheroids



Roldan Cuenya *et al.*, JACS. 125 (2003) 12928, JACS Comm. 125 (2003) 7148



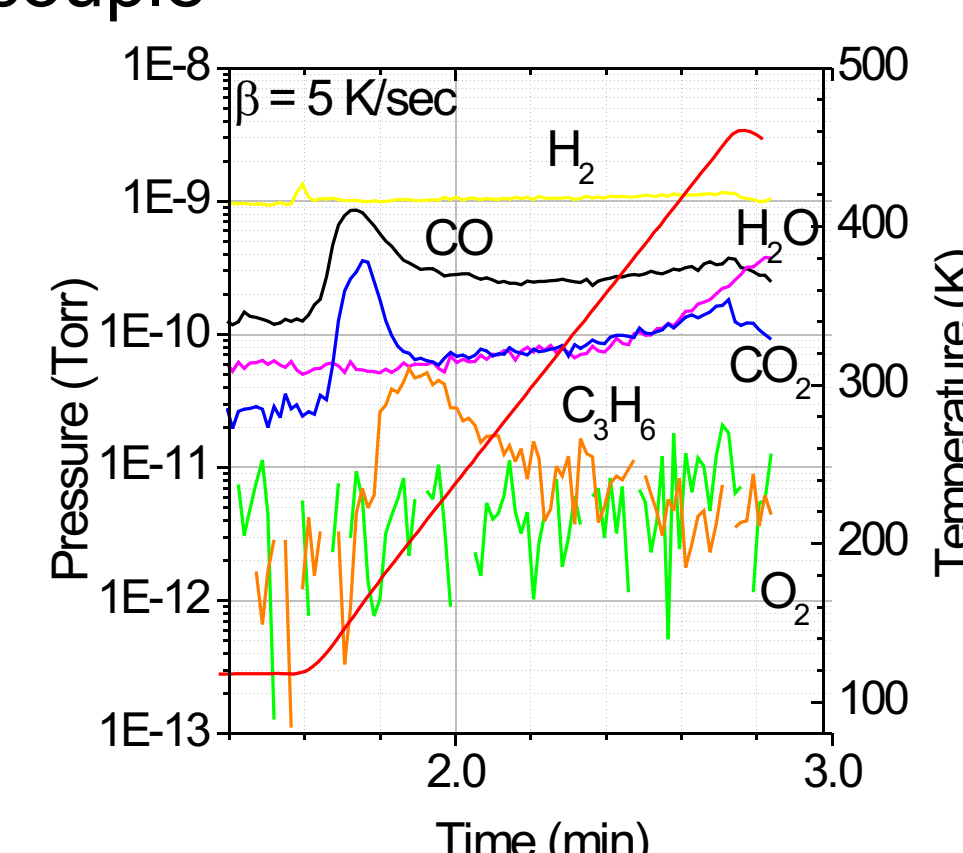
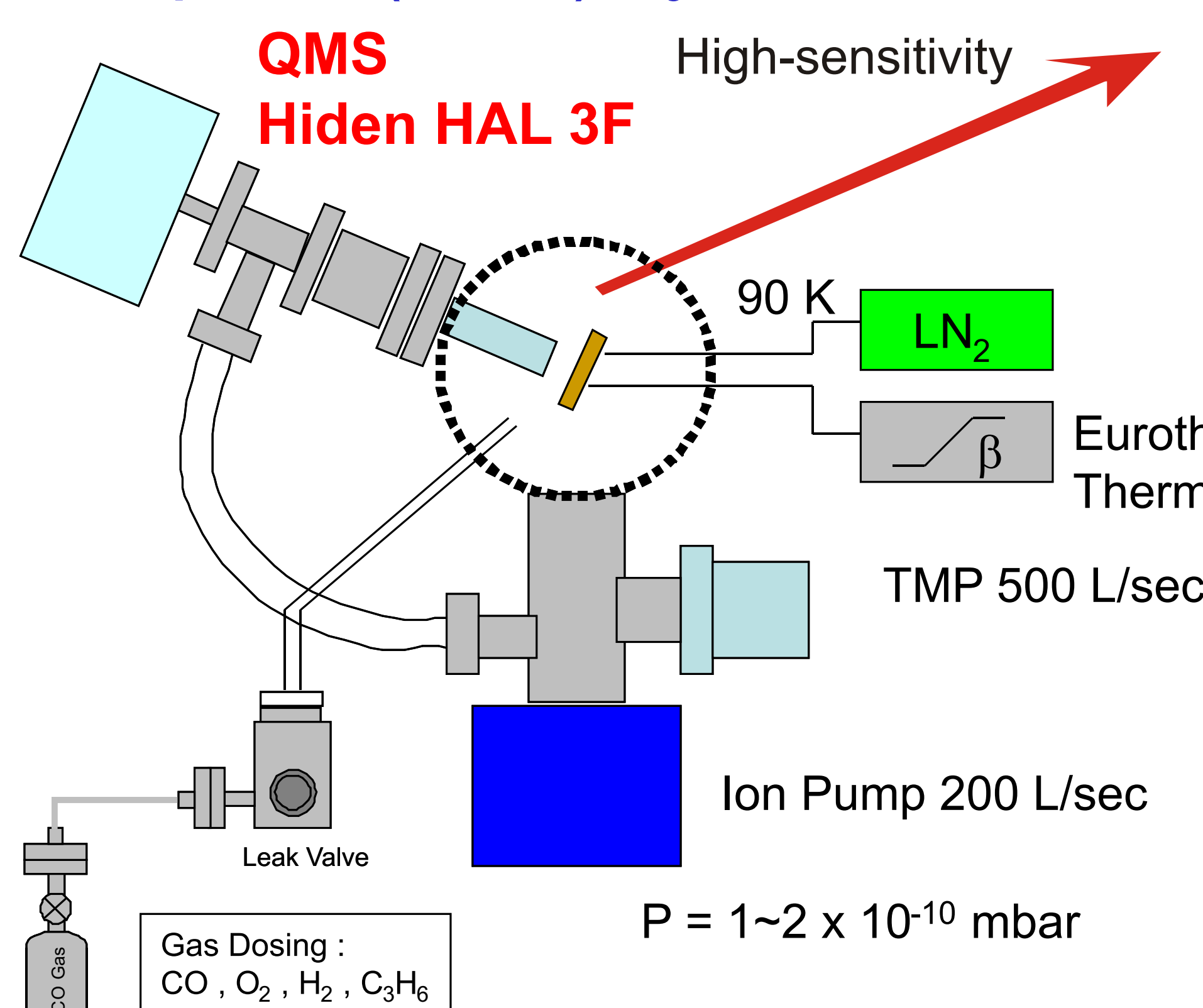
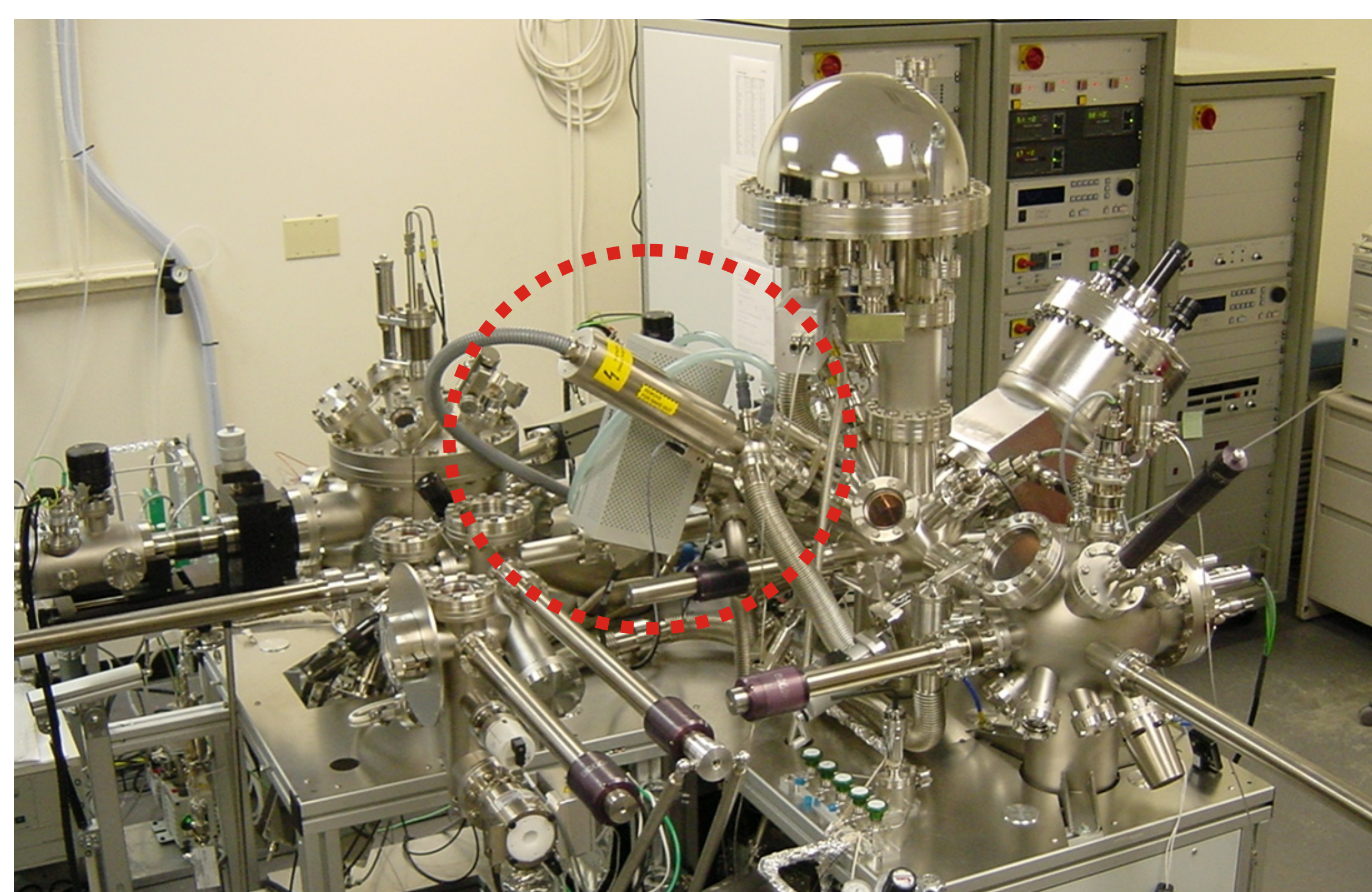
TEM :



Polycrystalline
Multifaceted fcc-Au

2. In-situ Chemical Characterization Setup

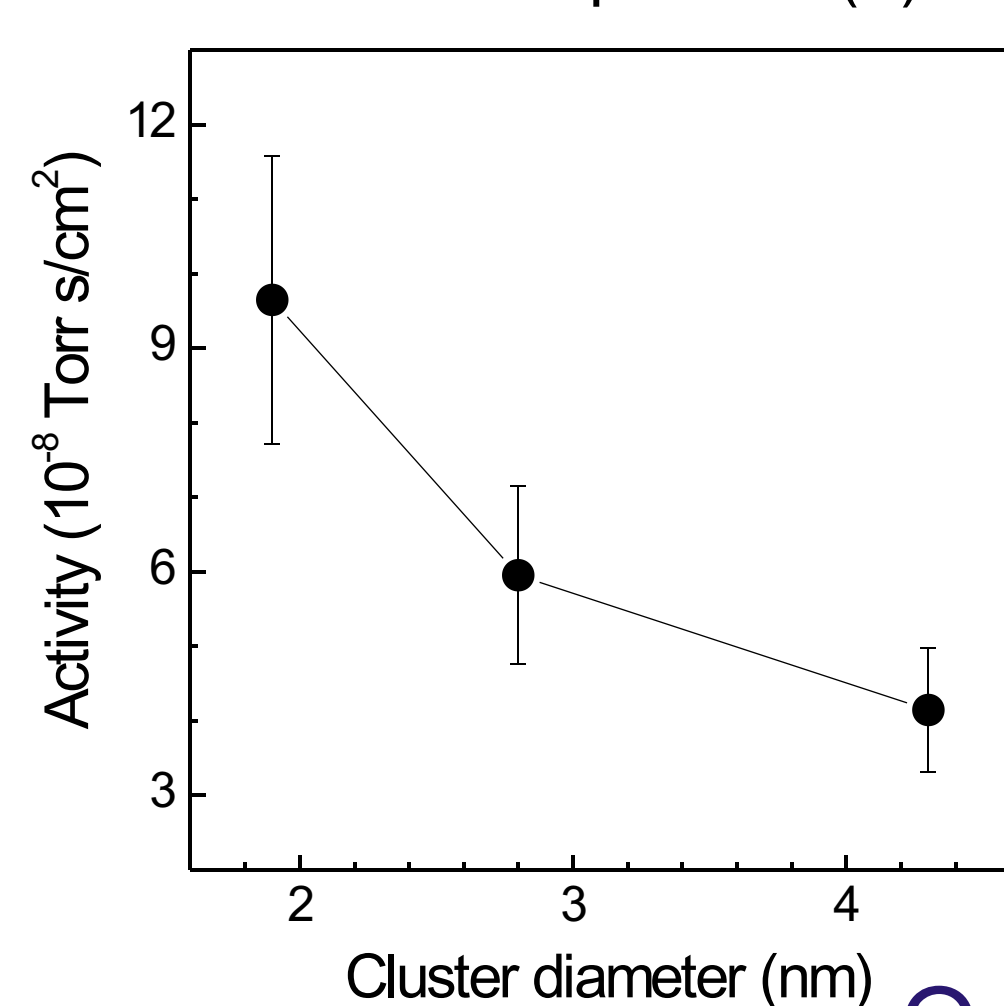
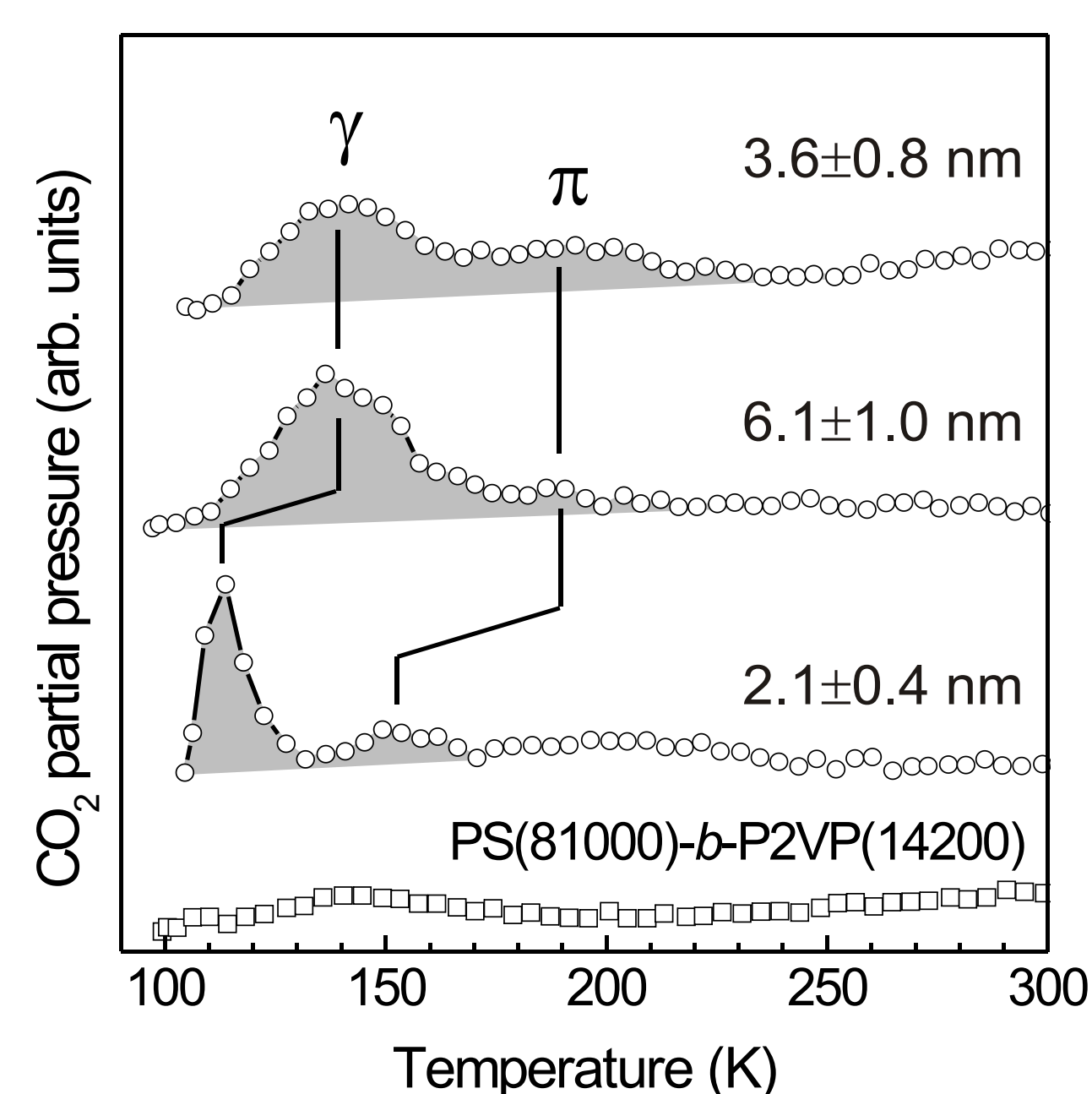
UHV temperature programmed desorption (TPD) system



3. Size dependent reactivity



Au/TiC



Ono *et al.*, Surf. Sci. 600 (2006) 5041

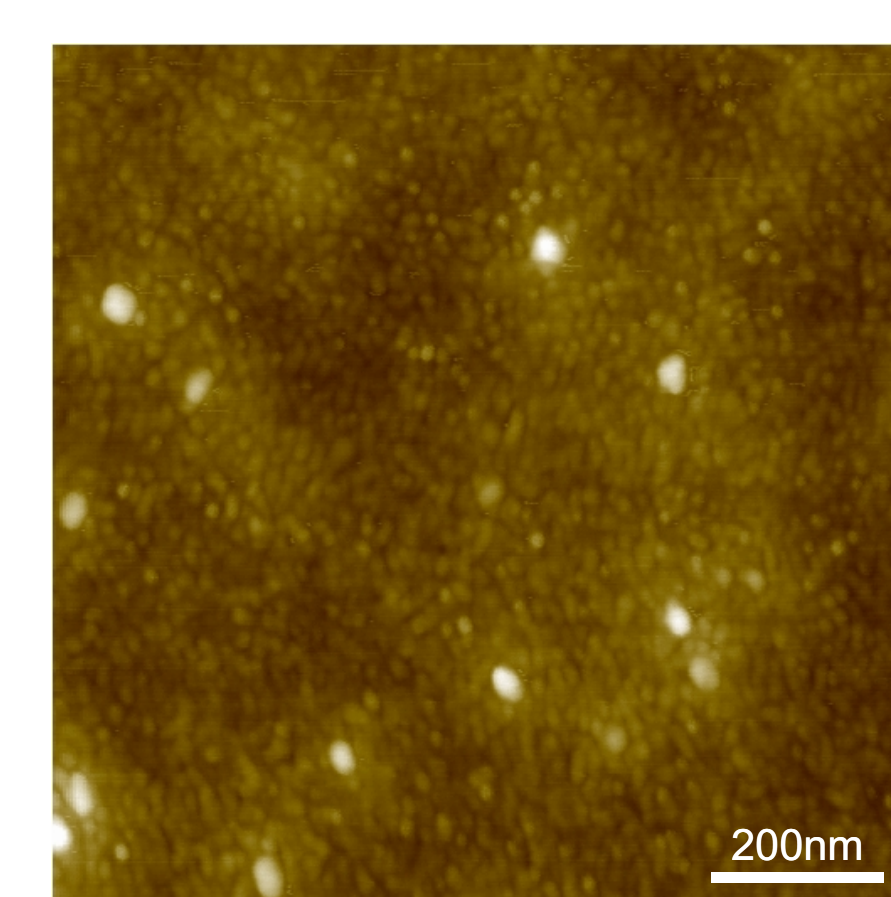
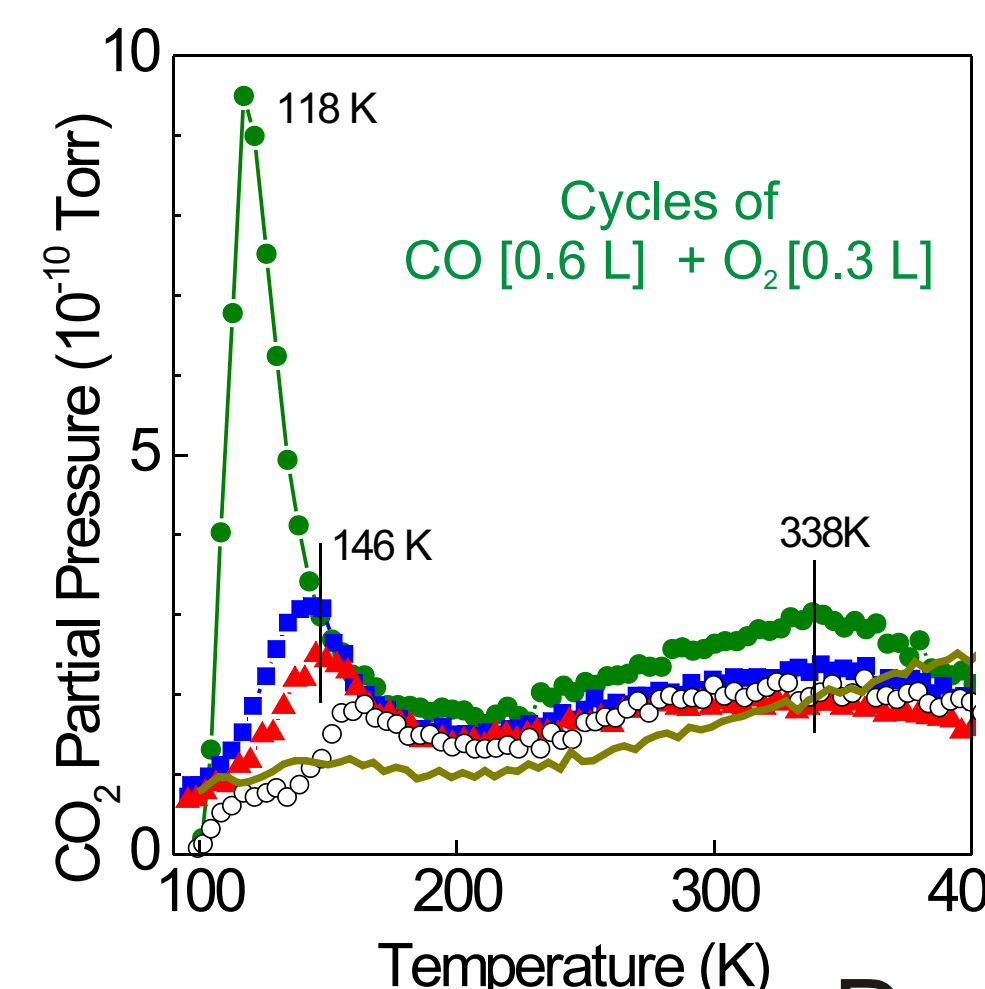
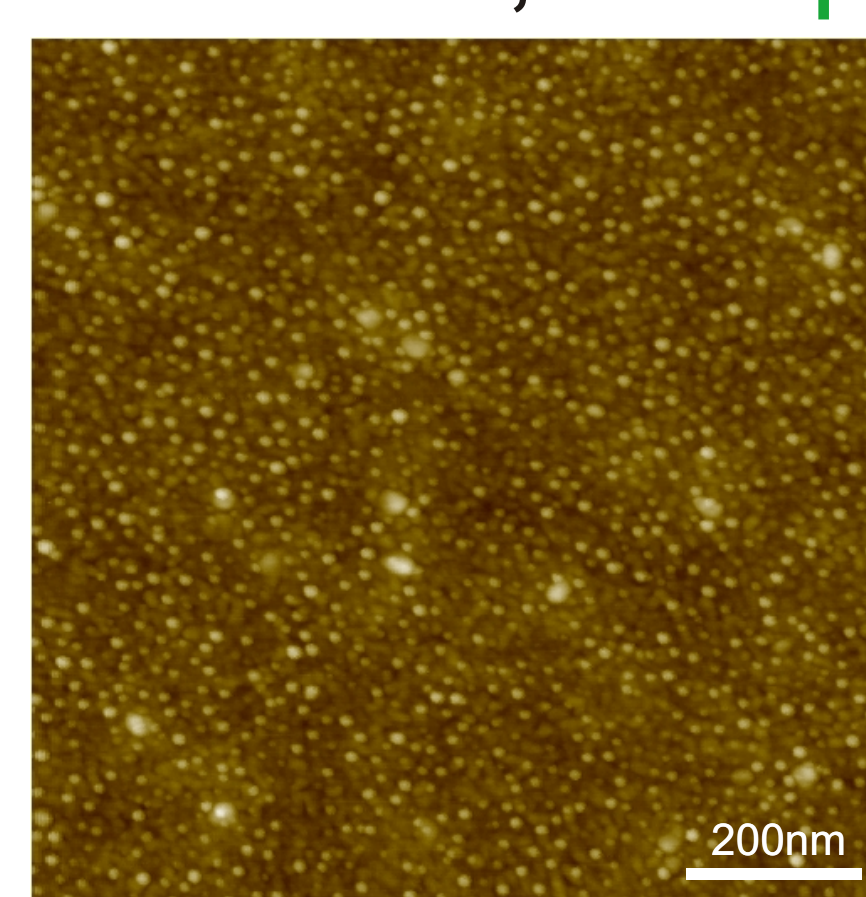


1. TiC inactive.
2. Two desorption sites :
γ : steps/kinks
π : Au-TiC interface
3. Relative Contribution :
 $A[\gamma] / A[\pi] \sim 3$
4. Highest activity for smallest nanoparticles (2.1 nm).

4. Influence of interparticle distance

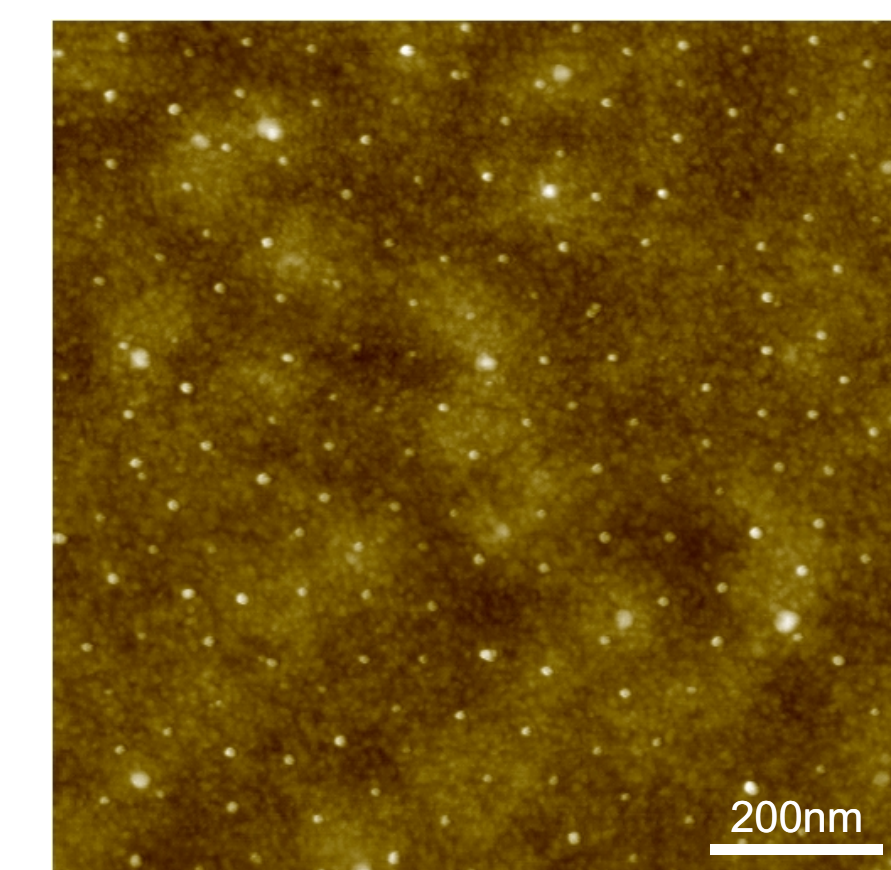
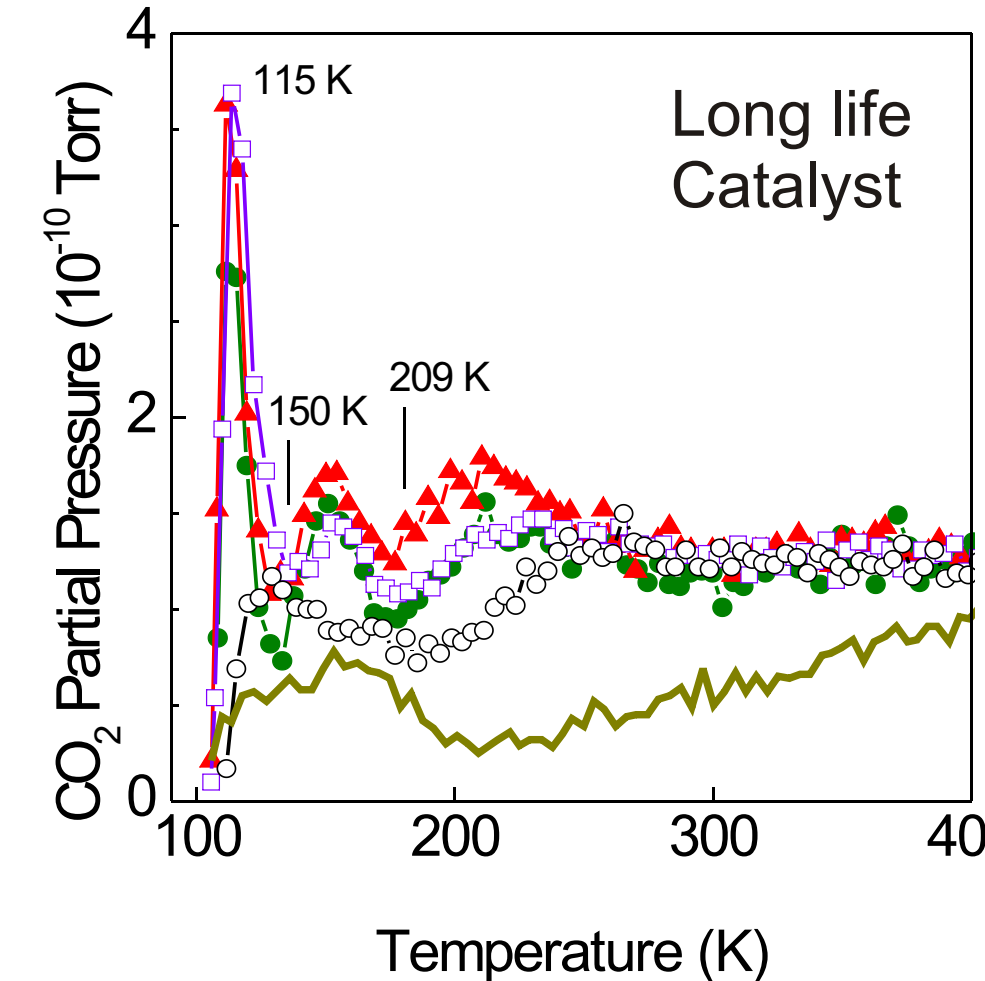
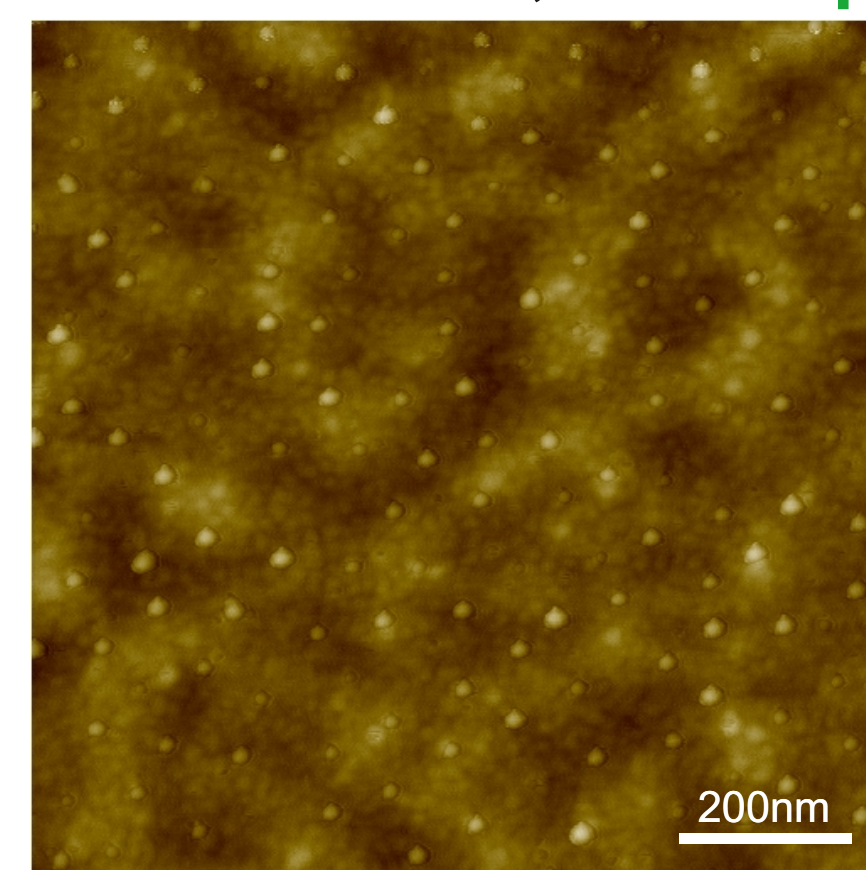
h ≈ 2 nm ; Interpart. Distance ≈ 30 nm

Au/TiC



Deactivation after 1st TPD.
Reactive coarsening.

h ≈ 2 nm ; Interpart. Distance ≈ 80 nm



No deactivation after
17 TPD cycles.

Ono *et al.*, Catal. Lett. 113 (2007) 86

5. Conclusions

- Au nanoparticles/TiC ⇒ active for low-T CO oxidation.
- Size-dependent reactivity ⇒ Highest activity for ~2 nm Au particles.
- Catalysts lifetime depends on initial interparticle distance.

Funding :

