

PG-SEM-IV Unit-III EC-1a Inorganic Chemistry Special

Homogeneous catalysis

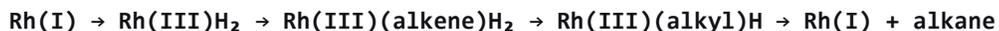
Process Safety

1. **High Pressure Reactions:**
 - CO, H₂ handling
 - Pressure vessel design
2. **Exothermic Reactions:**
 - Temperature control
 - Cooling systems

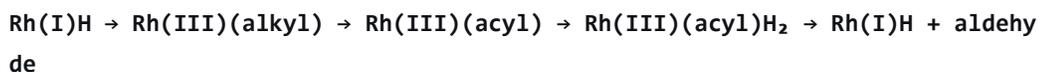
11. Important equations and concepts

3. Key Catalytic Cycles

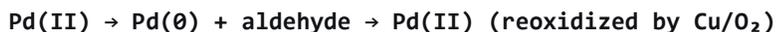
Hydrogenation (Wilkinson):



Hydroformylation:



3. Wacker Process:



Thermodynamic Considerations

- **ΔG** determines feasibility
- **ΔH** determines heat management
- **Activation energy** determines rate

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Notes

1. **Homogeneous catalysis** offers high selectivity under mild conditions
2. **Fundamental steps:** Oxidative addition, reductive elimination, migratory insertion
3. **Wilkinson's catalyst** revolutionized hydrogenation chemistry
4. **Ziegler-Natta polymerization** enables stereospecific polymer synthesis
5. **Hydroformylation** is a major industrial process for aldehydes
6. **Wacker process** converts ethylene to acetaldehyde
7. **C-H activation** enables direct functionalization of hydrocarbons
8. **Mechanistic understanding** guides catalyst design and optimization
9. **Industrial applications** span petrochemicals, polymers, pharmaceuticals
10. **Future directions** include green chemistry, asymmetric catalysis, and computational design