





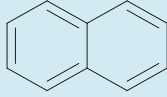
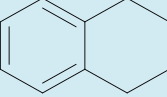
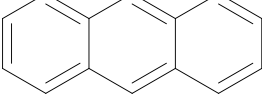
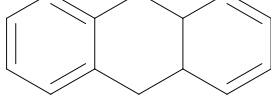
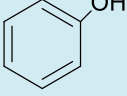
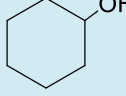
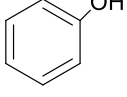
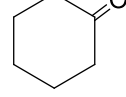
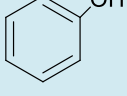

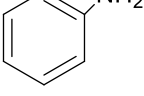
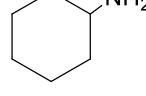
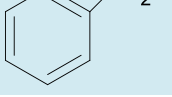
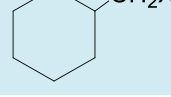
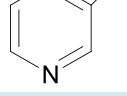
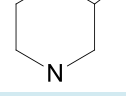
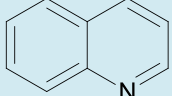
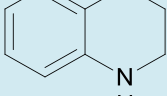


## 一、C-C 多键加氢反应 C-C Multiple Bonds Hydrogenation

Reactant	Product	Code	Catalyst	Comments
$\text{—CH=CH—}$	$\text{—CH}_2\text{—CH}_2\text{—}$	SC-90101A	Pd/C	Pd/C 可能会导致异构化, Pd/Al <sub>2</sub> O <sub>3</sub> 可以用于含芳香基团, 效果更好, Pt/C 有利于位阻较大的烯烃加氢
		SC-90101B	Pt/C	
		SC-90101C	Pd/Al <sub>2</sub> O <sub>3</sub>	
$\text{—CH=CH—CH=CH—}$	$\text{—CH}_2\text{—CH}_2\text{—CH=CH—}$	SC-90102A	Pd(Pb)/CaCO <sub>3</sub>	Pd 催化剂性能最佳 Pd Lindlar 催化剂
		SC-90102B	Pd/Al <sub>2</sub> O <sub>3</sub>	
$\text{—C}\equiv\text{C—}$	$\text{—CH=CH—}$	SC-90103A	Pd(Pb)/CaCO <sub>3</sub>	Pd Lindlar 催化剂
$\text{—C}\equiv\text{C—}$	$\text{—CH}_2\text{—CH}_2\text{—}$	SC-90104A	Pd/C	Pd 反应活性较高且条件温和
		SC-90104B	Pd/Al <sub>2</sub> O <sub>3</sub>	
		SC-90104C	Pd/CaCO <sub>3</sub>	
$\text{>CH=CH—CH=CH—}$	$\text{>CH=CH—CH}_2\text{—CH}_2\text{—}$	SC-90105A	Pd/C	优先还原位阻较小的双键
$\text{—CH=CH—X}$ X=OR, OCOR, Cl, Br, NHR	$\text{—CH}_2\text{—CH}_2\text{—X}$	SC-90106A	Pt/C	含卤素时在酸性或中性环境下反应, 其它适合在中性或碱性条件下反应
$\text{>C=CH—C(=O)—CH}_3$	$\text{>CH—CH}_2\text{—C(=O)—CH}_3$	SC-90107A	Pd/C	碱性助剂可提高选择性

## 二、芳香环化合物及杂环化合物加氢反应 Aromatic Ring Compounds Hydrogenation

Reactant	Product	Code	Catalyst	Comments
		SC-90201A	Pd/C	Pt 催化剂在低压反应中更稳定
		SC-90201B	Pt/C	
		SC-90202A	Ru/C	Rh 反应条件温和, Ru 需更高反应压力及反应温度 水可以促进 Ru 催化剂活性
		SC-90202B	Rh/C	
		SC-90202C	Rh/Al <sub>2</sub> O <sub>3</sub>	
		SC-90203A	Ru/C	水可以有效促进产物分离, 抑制过度氢化
		SC-90203B	Ru/Al <sub>2</sub> O <sub>3</sub>	
		SC-90204A	Pt/C	Pt 催化边缘环加氢
		SC-90204B	Pt/Al <sub>2</sub> O <sub>3</sub>	
		SC-90205A	Pd/C	Pd 催化内部环加氢
		SC-90206A	Rh/C	Rh 具有高选择性
		SC-90206B	Rh/Al <sub>2</sub> O <sub>3</sub>	
		SC-90207A	Pd/C	碱性助剂可提高活性及选择性
		SC-90208A	Pt/C	醋酸或水/盐酸体系活性较高
		SC-90209A	Ru/Al <sub>2</sub> O <sub>3</sub>	注意抑制副产物
		SC-90209B	Rh/Al <sub>2</sub> O <sub>3</sub>	
		SC-90210A	Rh/C	铑催化剂活性高有效抑制脱卤
		SC-90210B	Rh/Al <sub>2</sub> O <sub>3</sub>	
		SC-90211A	Pd/C	醋酸可提高活性
		SC-90211B	Rh/C	
		SC-90211C	Ru/C	
		SC-90212A	Pd/C	铂选择性高, 酸有利于反应进行
		SC-90212B	Pt/C	

		SC-90213A	Rh/C	铑催化剂活性高
		SC-90214A SC-90214B	Rh/C Pt/C	酸有利于提高活性
		SC-90215A SC-90215B	Pd/C Rh/C	呋喃含取代基时加氢较难

### 三、羰基化合物加氢反应 Carbonyl compounds Hydrogenation

Reactant	Product	Code	Catalyst	Comments
RCHO	RCH <sub>2</sub> OH	SC-90301A SC-90301B	Ru/C Pt/C	Ru 在水中具有更好的催化作用
—CH=CH—CHO	—CH=CH—CH <sub>2</sub> OH	SC-90302A SC-90302B	Pt/C Pt/Graphite	Pt/石墨选择性高，防止过度氢化
		SC-90303A	Pd/C	使用碱性载体 Pd/C 抑制氢解
		SC-90304A	Pd/C	强酸促进反应
		SC-90305A SC-90305B	Ru/C Pt/C	Ru 在水中具有更好的催化作用
—CH=CH—C(=O)—	—CH=CH—CH(OH)—	SC-90306A SC-90306B	Pt/C Pt/Graphite	Pt/石墨具有更高的选择性
		SC-90307A SC-90307B	Rh/C Ru/C	防止氢解反应
		SC-90308A	Pd/C	强酸可促进反应
		SC-90309A	Pd/C	强酸可促进反应
ROH+CO		SC-90310A	Pd/C	钝化催化剂防止催化剂中毒
R-COCl	R-CHO	SC-90311A SC-90311B	Pd/C Pd/BaSO <sub>4</sub>	使用耐酸能力强载体
R-COOH	R-CH <sub>2</sub> OH	SC-90312A SC-90312B SC-90312C	Ru/C Ru/Al <sub>2</sub> O <sub>3</sub> Pd/C	Ru 催化剂可以抑制过度氢化

### 四、硝基化合物加氢反应 Nitro&Nitrosyl Compounds Hydrogenation

Reactant	Product	Code	Catalyst	Comments
R-NO <sub>2</sub>	R-NH <sub>2</sub>	SC-90401A SC-90401B	Pd/C Pt/C	碱性胺产物可使催化剂中毒，酸可加快产物脱附加快反应速度

$-\text{CH}=\text{CH}-\text{NO}_2$	$-\text{CH}_2-\text{CH}_2-\text{NH}_2$	SC-90402A	Pd/C	酸可阻止形成二聚体
		SC-90403A	Pd/C	使用中性溶剂，酸性溶剂促进反应
		SC-90404A SC-90404B	Pt/C Pt/CaCO <sub>3</sub>	DMSO 作溶剂反应条件温和
		SC-90405A	Pd/C	低极性、碱性溶剂可促进反应
		SC-90406A	Pt/C	H <sub>2</sub> SO <sub>4</sub> 可促进反应
		SC-90407A SC-90407B	PtO <sub>2</sub> Pt-S/C	硫化的 Pt 催化剂具有较好活性
		SC-90408A	Pt-S/C	脱卤稳定性顺序为 I>Br>Cl>F,
		SC-90409A	Pt/C	铂催化剂抑制脱卤选择性优

### 五、还原烷基化加氢反应 Reductive Alkylations Hydrogenation

Reactant	Product	Code	Catalyst	Comments
+ 2HCHO		SC-90501A	Pt-S/C	硫化 Pt 催化剂可避免醇解反应
+ $\text{R}-\text{C}(=\text{O})-\text{R}'$		SC-90502A	Pt-S/C	硫化 Pt 催化剂可避免醇解反应
+ NH <sub>3</sub>		SC-90503A	Pd/C	环己酮参与形成希夫碱
+ NH <sub>3</sub>		SC-90504A	Pd/C	高活性催化剂避免过度加氢

### 六、腈类、肟类加氢反应 Nitriles&Oximes Hydrogenation

Reactant	Product	Code	Catalyst	Comments
RCN	RCH <sub>2</sub> NH <sub>2</sub>	SC-90601A SC-90601B	Pd/C Rh/C	乙醇作溶剂最佳
RCN	(RCH <sub>2</sub> ) <sub>3</sub> N	SC-90602A SC-90602B	Pd/C Pt/C	Pt 催化剂选择性好
		SC-90603A SC-90603B SC-90603C	Pd/C Pd/Al <sub>2</sub> O <sub>3</sub> Rh/C	Rh 选择性较好
		SC-90604A SC-90604B	Pd/C Pt/C	Pt 催化剂选择性好

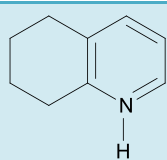
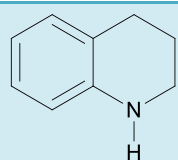
		SC-90605A	Pd/C	酸可促进反应进行
RCH=NOH	RCH <sub>2</sub> -NHOH	SC-90606A	Pd/C	Pd 催化剂活性高
RCH=NOH	RCH <sub>2</sub> -NH <sub>2</sub>	SC-90607A SC-90607B	Pd/C Rh/C	Rh 催化剂选择性好

## 七、氢解、脱卤加氢反应 Hydrogenolysis &amp; Dehalogenation Hydrogenation

Reactant	Product	Code	Catalyst	Comments
 X=NH <sub>2</sub> ,NHR,OR,OCOR		SC-90701A	Pd/C	酸性促进氢解反应
		SC-90702A	Pd/C	酸性促进氢解反应
		SC-90703A	Pd/C	酸性促进氢解反应
		SC-90704A	Pd/C	Pd 较常用
		SC-90705A	Pd/C	Pd 较常用
		SC-90706A	Pd/C	Pd 较常用
		SC-90707A	Pd/C	有机碱可提高选择性
		SC-90708A	Pd/C	使用耐酸性载体
$\text{—CH=CHX}$ X=Cl,Br,OR,OCOR,NHR	$\text{—CH}_2\text{—CH}_3$	SC-90709A	Pd/C	碱性助剂有利于卤素的脱除；酸性助剂利于其它基团脱除，高温低压有利于反应
R-X	RH + HX	SC-90710A	Pd/C	高温低压有利于反应

## 八、歧化、异构化反应 Isomerization &amp; disproportionation

Reactant	Product	Code	Catalyst	Comments
		SC-90801A	Pd/C	Pd 效果最好
$\text{—CH}_2\text{—CH}_2\text{—CH=CH}_2$	$\text{—CH}_2\text{—CH=CH—CH}_3$	SC-90802A	Pd/C	Pd 较常用
		SC-90803A	Pd/C	Pd 效果好



SC-90804A

Pd/C

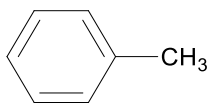
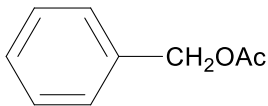
Pd 较常用

## 九、脱氢及氧化反应 Dehydrogenation and Oxidation

Reactant	Product	Code	Catalyst	Comments
		SC-90901A	Pt/Al <sub>2</sub> O <sub>3</sub>	碱金属可抑制积炭生成
		SC-90902A	Pt/C	中性或碱性体系
		SC-90903A	Ru/C	中性或碱性体系
		SC-90904A	Pt/Graphite	中性或碱性体系
		SC-90905A	Pd/C	及时除氢可提高活性
CH <sub>2</sub> =CH <sub>2</sub>	CH <sub>3</sub> -CHO	SC-90906A	Pd/C	醋酸或醋酸盐可促进反应
		SC-90907A	Pd/C	醋酸或醋酸盐可促进反应
		SC-90908A SC-90908B	Pd/C Pt/C	有机酸体系
RCH <sub>2</sub> OH	R-CHO	SC-90909A SC-90909B	Pt/C Pd-Pb/C	Pt 性价比高
RCH <sub>2</sub> OH	R-COOH	SC-90910A SC-90910B	Pt/C Pd/C	Pt 性价比高
HO(CH <sub>2</sub> ) <sub>4</sub> OH		SC-90911A	Pd-Pb/C	Pb 可促进反应和选择性
		SC-90912A	Ru/C	加水可促进反应活性

## 十、羰基化, 乙酰氧基化 Carbonylation &amp; acetoxylation

Reactant	Product	Code	Catalyst	Comments
CH <sub>3</sub> OH + CO + 1/2 O <sub>2</sub>	(CH <sub>3</sub> O) <sub>2</sub> CO	SC-91001A	Pd-Cu/C	少量盐酸可延长催化剂寿命

$\text{CH}_2=\text{CH}_2$	$\text{CH}_2=\text{CHOAc}$	SC-91002A	Pd/SiO <sub>2</sub>	中性或碱性体系
		SC-91003A	Pd/C	中性或碱性体系

### 十一、分解反应 Decomposition

Reactant	Product	Code	Catalyst	Comments
NaClO <sub>3</sub>	NaCl + H <sub>2</sub> O	SC-91101A	Ru/C	Ru 催化剂性价比高
H <sub>2</sub> O <sub>2</sub>	H <sub>2</sub> O + O <sub>2</sub>	SC-91102A	Ru/Al <sub>2</sub> O <sub>3</sub>	碱性条件活性更高
N <sub>2</sub> H <sub>2</sub>	N <sub>2</sub> + H <sub>2</sub>	SC-91103A SC-91103B	Ir/Al <sub>2</sub> O <sub>3</sub> Ni/Al <sub>2</sub> O <sub>3</sub>	Ir 催化剂最稳定
O <sub>3</sub>	3/2 O <sub>2</sub>	SC-91104A SC-91104B	Pd/Al <sub>2</sub> O <sub>3</sub> Pt/Al <sub>2</sub> O <sub>3</sub>	Pt 效果好
NH <sub>3</sub>	1/2 N <sub>2</sub> + 3/2 H <sub>2</sub>	SC-91105A SC-91105B SC-91105C	Ru/Al <sub>2</sub> O <sub>3</sub> Ru/ZrO <sub>2</sub> Rh	碱性助剂可明显提高催化剂性能