

# WINNERS of CHEMISTRY/PHYSICS NOBEL PRIZE

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**1996: ROBERT F. CURL, Jr. , SIR HAROLD W. KROTO , and RICHARD E. SMALLEY**  
for their discovery of fullerenes

**1987: DONALD J. CRAM , JEAN-MARIE LEHN and CHARLES J. PEDERSEN**  
for their development and use of molecules with structure-specific interactions of high selectivity

**1986: The Nobel Prize in Physics 1986: Ernst Ruska** "for his fundamental work in electron optics,  
and for the design of the first electron microscope"  
**Gerd Binnig and Heinrich Rohrer** "for their design of the scanning tunneling microscope"

**1981: KENICHI FUKUI and ROALD HOFFMANN**  
for their theories, developed independently, concerning the course of chemical reactions

**1965: ROBERT BURNS WOODWARD** for his outstanding achievements in the art of organic synthesis

**1950: OTTO PAUL HERMANN DIELS and KURT ALDER**  
for their discovery and development of the diene synthesis

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**2023 - Mounqi G. Bawendi, Louis E. Brus, Aleksey Yekimov**

"for the discovery and synthesis of quantum dots"

**2022 – C. Bertozzi, Morten Meldal, K. Berry Sharpless** "for the development of click chemistry and bioorthogonal chemistry»

**2021 - Benjamin List and David MacMillan** "for the development of asymmetric organocatalysis"

**2016 Jean-Pierre Sauvage, Sir J. Fraser Stoddart and Bernard L. Feringa**

"for the design and synthesis of molecular machines"

**2010 Richard F. Heck, Ei-ichi Negishi and Akira Suzuki**

"for palladium-catalyzed cross couplings in organic synthesis"

**The Nobel Prize in Physics 2010: Andre Geim and Konstantin Novoselov**

"for groundbreaking experiments regarding the two-dimensional material graphene"

**2005: Yves Chauvin, Robert Grubbs e Richard Schrock** for the development of the metathesis method in organic synthesis.

**2001: WILLIAM S. KNOWLES**, and **RYOJI NOYORI**, for their work on chirally catalysed hydrogenation reactions  
**K. BARRY SHARPLESS** for his work on chirally catalysed oxidation reactions

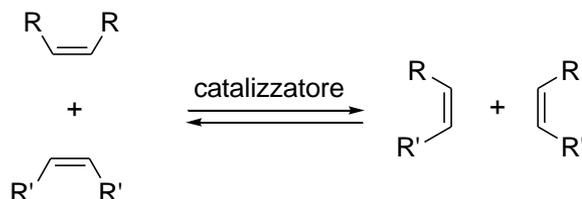
**2000: Alan J. Heeger, Alan G. MacDiarmid and Hideki Shirakawa**

"for the discovery and development of conductive polymers"

# REAZIONE DI METATESI

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*Principio generale di metatesi di olefine sostituite in modo simmetrico.*

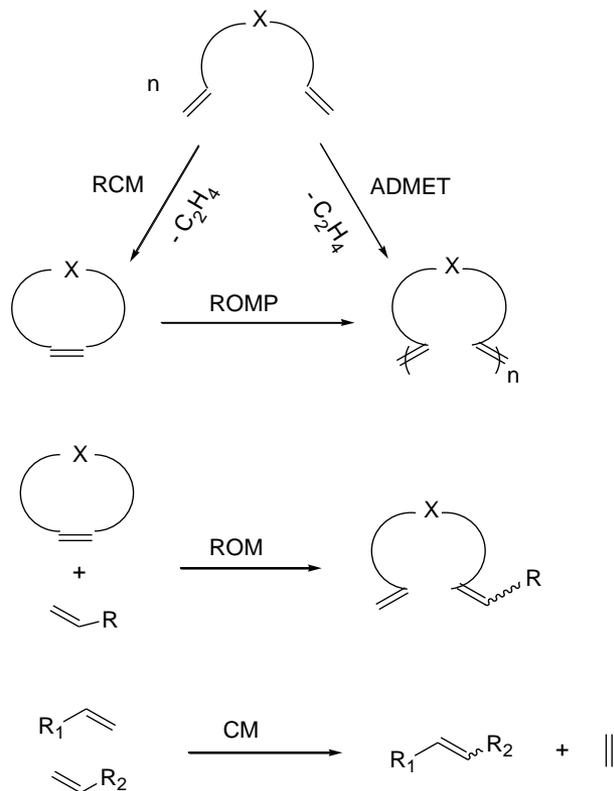


Yves Chauvin, Robert Grubbs e Richard Schrock

Nobel per la Chimica 2005

- K. C. Nicolau, P. G. Bulger, D. Sarlah, Metathesis Reactions in Total Synthesis, *Angew. Chem. Int. Ed.*, 44, 4490-4527 (2005).
- F. Amblard, S. P. Nolan, L. A. Agrofoglio, Methatesis strategy in nucleoside chemistry, *Tetrahedron*, 61, 7067-7080 (2005).
- R. H. Grubbs, Olefin methatesis, *Tetrahedron*, 60, 7117-7140 (2004).
- A. Deiters, S. F. Martin, Synthesis of oxygen- and nitrogen-containing heterocycles by ring-closing methatesis, *Chem. Rev.*, 104, 2199-2238 (2004).
- A. D. Piscopio, J. E. Robinson, Recent applications of olefin methatesis to combinatorial chemistry, *Curr. Opin Chem. Biol.*, 8, 245-254 (2004).
- S. J. Connon, S. Blechert, Recent developments in olefin cross-methatesis, *Angew. Chem. Int. Ed.*, 42, 1900-1923 (2003).

## Diverse reazioni di metatesi di olefine



RCM = ring-closing metathesis

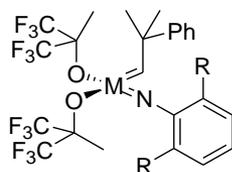
ROM = ring-opening metathesis

ROMP = ring-opening metathesis polymerization

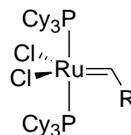
ADMET = acyclic diene metathesis polymerization

CM = cross-methathesis

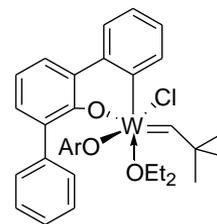
## Alcuni catalizzatori e precatalizzatori usati nelle reazioni di metatesi



1 (M = Mo, W)

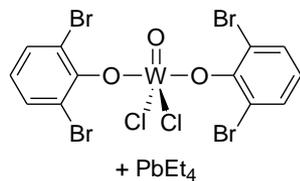


2



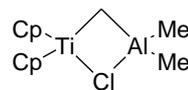
3

R = Ph, CH=CPh<sub>2</sub>, ecc.

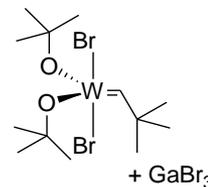


+ PbEt<sub>4</sub>

4



5

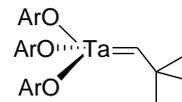


+ GaBr<sub>3</sub>

6

[MeReO<sub>3</sub>] / Al<sub>2</sub>O<sub>3</sub>

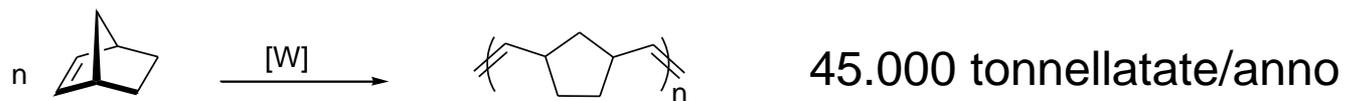
7



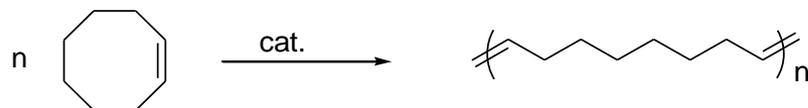
8 (Ar = 2,6-*i*Pr<sub>2</sub>C<sub>6</sub>H<sub>3</sub>)

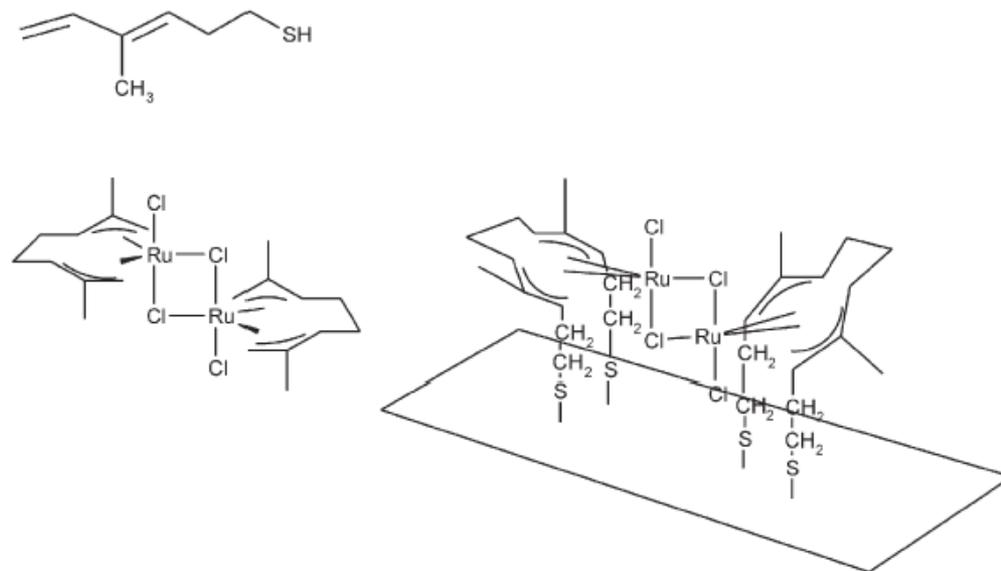
## Reazione di metatesi applicata ad alcuni processi industriali

Processo Norsorex

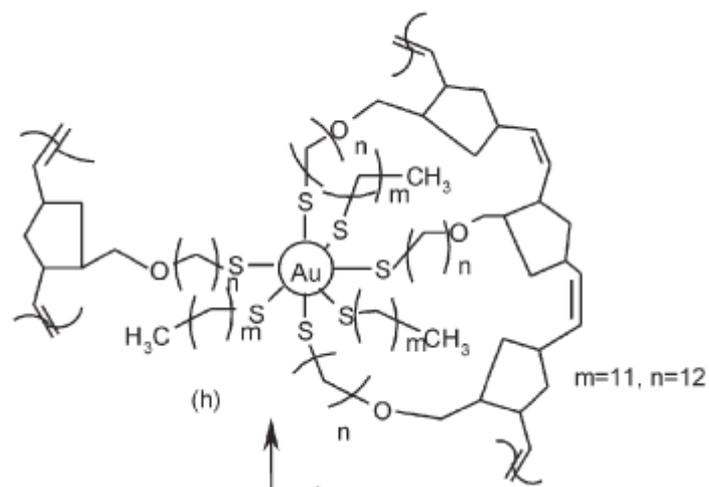


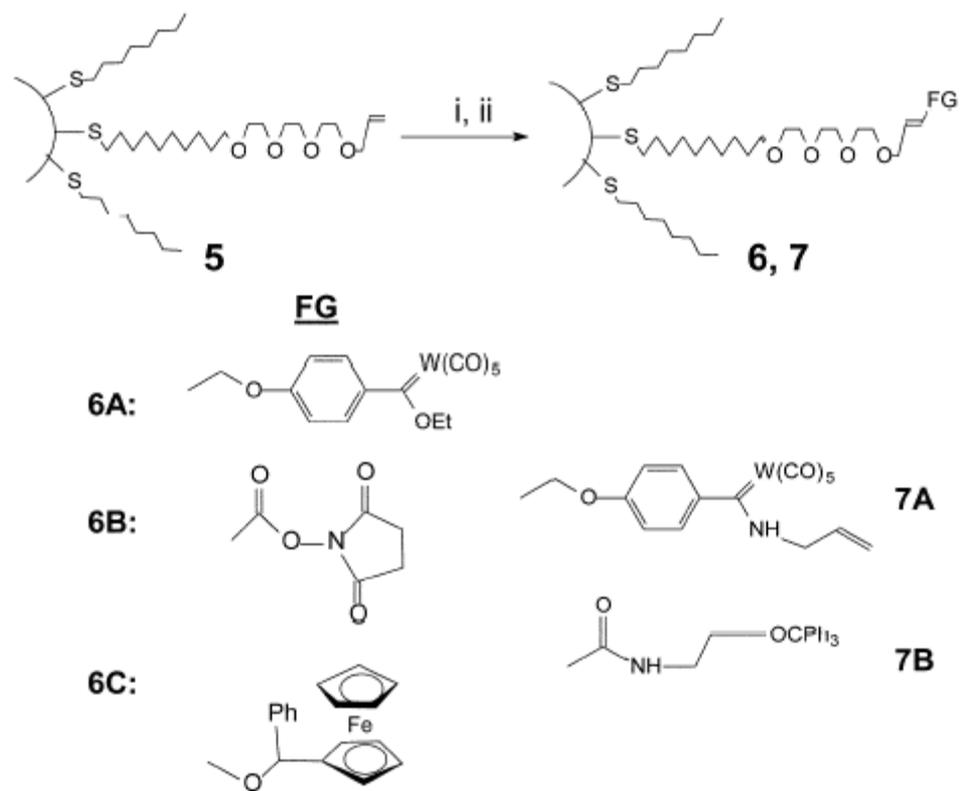
Processo Hüls-Vestenamer





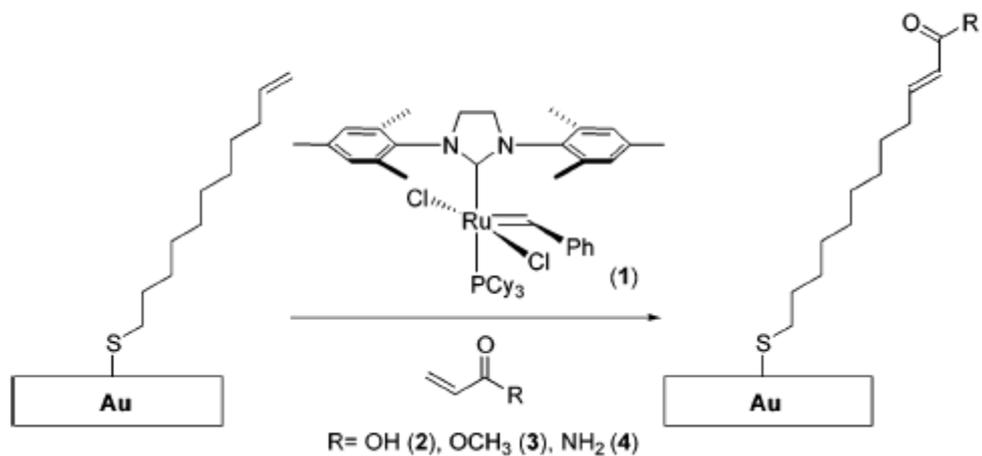
**Scheme 19** A colloid-bound catalyst for olefin metathesis polymerization: the ligand used for colloid preparation, the homogeneous catalyst, and the surface-bound catalyst.<sup>134</sup>



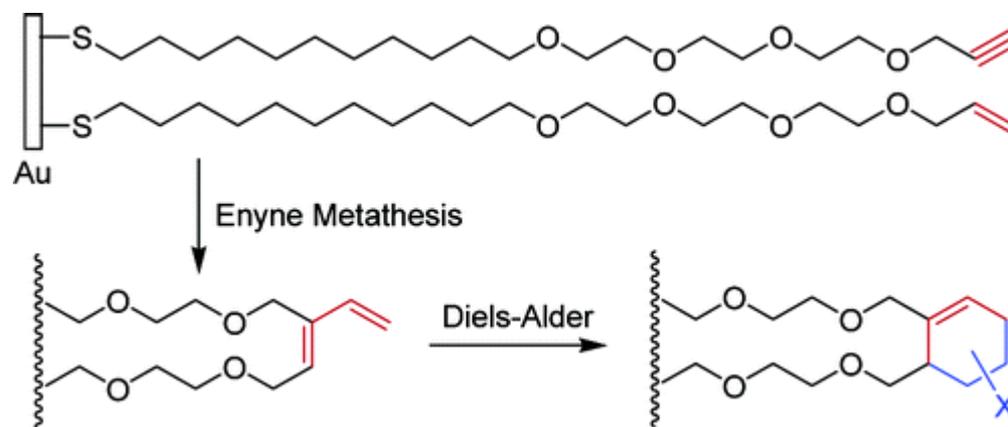


**Scheme 2** Cross-metathesis reaction followed by aminolysis on gold colloids. *Reagents and conditions:* i,  $\text{CH}_2=\text{CH}-\text{FG1}$ ,  $\text{Cl}_2(\text{Pcy}_3)_2\text{Ru}=\text{CH}-\text{Ph}$  (cat.),  $\text{CH}_2\text{Cl}_2$ , 12 h; ii,  $\text{RNH}_2$ ,  $\text{CH}_2\text{Cl}_2$ , 5 h.

### Scheme 1. Schematic Description of the Procedure.

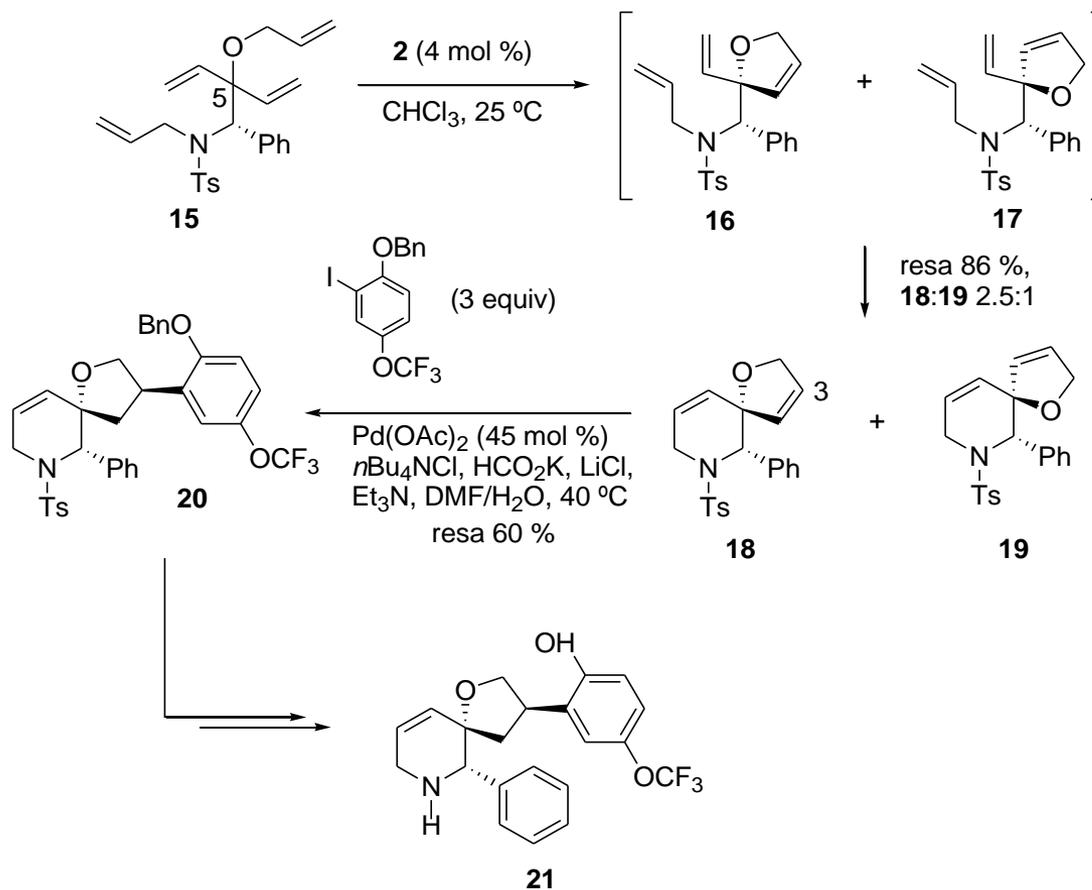


*Langmuir* **2003**, *19*, 8141-8143



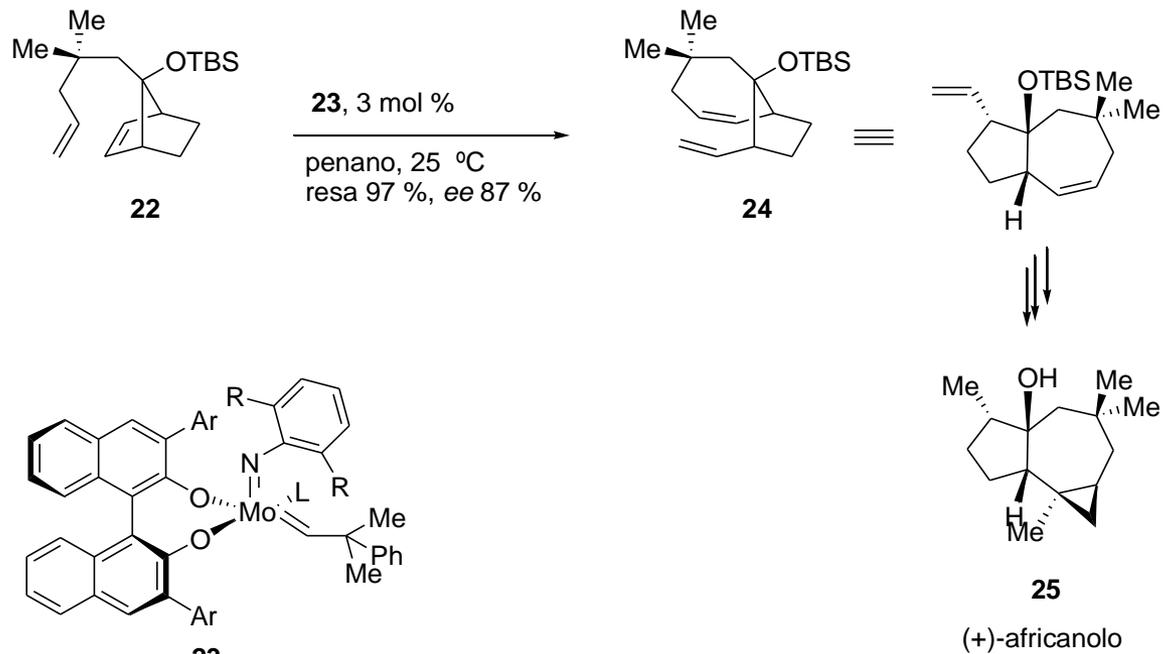
*Langmuir* **2005**, *21*, 10311-10315

# Sintesi dell'antagonista del recettore NK-1 via doppia RCM diastereoselettiva e reazione di Heck riduttiva (Merck)



antagonista del recettore NK-1

## Reazioni di metatesi consecutive di chiusura e apertura di anello nella sintesi enantioselettiva del (+)-africanolo



R = *i*Pr, Ar = 2,4,6-*i*Pr<sub>3</sub>C<sub>6</sub>H<sub>2</sub>, L = THF