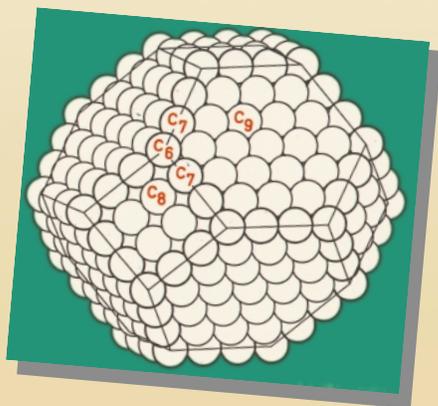


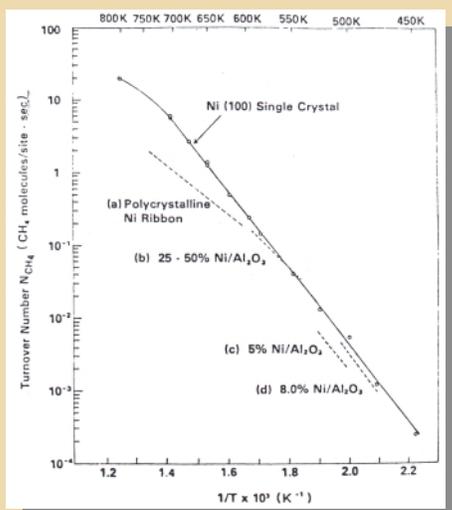
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Method to calculate the coordination numbers of surface atoms in the stable forms of small metal particles



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Comparison of rate of  $\text{CH}_4$  synthesis over a Ni (100) catalyst



**1964:** Blyholder (J. Phys. Chem., 68, 2772 (1964)) suggested that CO adsorption on transition metals can be described by a molecular orbital picture of two contributions to bonding, partial donation of CO-5s charge to metal ds orbitals and back donation from metal dp to CO 2p\* antibonding orbitals.

**1964:** Startup by Monsanto of the world's first biodegradable detergents plant based upon  $\text{C}_{10}$ - $\text{C}_{14}$  linear olefins obtained by selective catalytic dehydrogenation of n-paraffins.

**1965:** Wilkinson's homogeneous hydrogenation catalyst, J.F. Young, J.A. Osborn, F.H. Jardine and G. Wilkinson, Chem. Commun., (1965) 131. G. Wilkinson is the 1973 Nobel Laureate in Chemistry.

**1966:** ICI developed a moderate-pressure, low-temperature methanol synthesis process employing a  $\text{Cu-ZnO/Al}_2\text{O}_3$  catalyst in a gas-recycle reactor.

**1966:** Introduction of concept of hard and soft acids and bases to catalysis (R. G. Pearson, Science, 151, 172 (1966)).

**1966:** Development of a method to calculate the coordination numbers of surface atoms in the stable forms of small metal particles (R. van Hardeveld and A. van Montfoort, Surface Sci., 4, 396 (1966)).

**1967:** Introduction of first bimetallic naphtha reforming catalyst -  $\text{Pt-Re-Al}_2\text{O}_3$  - need for presulfidation of a naphtha reforming catalyst.

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**1967:** Catalysis Reviews begins publication with H. Heinemann as editor.

**1967:** Atlantic Richfield and Halcon (formerly Scientific Design) formed a joint venture, Oxirane, to produce styrene, propylene oxide and tert-butyl alcohol.

**1967:** Summaries of Linear Free Energy Relationships (LFER) in Heterogeneous Catalysis (M. Kraus, Adv. Catal., 17, 75 (1967); I. Mochida and Y. Yoneda, J. Catal., 7, 386 (1967)).

**1968:** Shape selective catalysis - Selectoforming with erionite.

## 3rd Decade: 1979 - 1988

**1970's:** Rh-catalyzed hydroformylation of propene.

**1970's:** Improved selectivity for oxidation of ethene to ethylene oxide using Cs (or Cl) promoted Ag catalysts.

**1970's:** Introduction of use of controlled atmospheric transmission electron microscopy for catalyst characterization and kinetics of catalysis.

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