# Fischer Tropsch Process

# Reactor Technologies

#### Slurry 3-ø Reactor

- continuous catalyst removal/exchange
   excellent temperature
- distribution and control - challenging separation of wax and catalyst
- abrasion

Operating conditions

#### Fixed Bed 2-φ Reactor

- easy separation of liquid products
- high pressure drop
- offline catalyst removal/exchange
- considerable temperature gradients

#### Fluidized Bed 2-φ Reactor

- + virtually isotherm
- + high conversion
- only for high temperatures to avoid wax agglomeration
   → only short-chain hydrocarbons
- abrasion

# Operating Conditions

#### Impact on product distribution

	Chain growth probability α	Olefin / Paraffin ratio	Branching	Oxygenates	Methane
GHSV	1	1		1	1
Temperature	1		1		1
Pressure	1		1	1	1
Inlet H <sub>2</sub> /CO ratio	1		1	1	1

# Catalysts

#### Iron

- WGS active → variable H<sub>3</sub>/CO inlet ratios
- · produces rather complex product mix
- wide possible temperature range
  →LTFT and HTFT reasonable

Promoters: Na. K. Cu. MgO, Mn. Zr. Ni

#### Cobalt

- no WGS activity
- · produces mostly paraffins
- excessive methane formation at high temperatures → only LTFT recommended

Promoters: Pt, Ru, Re, Ag, Rh, Zn, K

# Supports

- Common: Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, TiO<sub>2</sub> Current Research: SiC, zeolites
- Affect: reducibility, mechanical resistance, adsorption properties, electron density on surface, surface area, dispersion

# Bi-functionality

- Function: modification of the product distribution by an acid-forming material in the reactor
- Reactions: hydrocracking, hydroisomerization
- Acid donors: zeolites, alumina, silica, carbon

**PT Brinkman** 

Frontiers and Tasks of Catalysis Towards the Next Century Sakae Uemura, Takeaki Mitsudo, Masatate Frontiers and Tasks of Catalysis Towards the Next Century ,1998 **Index of Conference** Haruta, 1998-03 **Proceedings** British Library. Document Supply Centre, 2003 Catalysis J. J. Spivey, 1999 Catalysis will be of interest to anyone working in academia and industry that needs an up to date critical analysis and summary of catalysis research and New Frontiers in Catalysis, Parts A-C L. Guczi, F. Solymosi, P. Tétényi, 1993-04-20 These volumes comprise applications the proceedings of the major international meeting on catalysis which is held at 4 year intervals. The programme focussed on New Frontiers in Catalysis including nontraditional catalytic materials and environmental catalysis The contributions cover a wide range of fundamental applied industrial and engineering aspects of catalysis The extensive range of highly efficient industrial techniques for observing and characterizing catalytically important surfaces is evident. The programme covered the following sessions Mechanism theory in situ methods Catalytic reaction on atomically clean surfaces Catalytic reaction on zeolites and related substances New methods and principles for catalyst preparation Hydrotreatment reactions HDS HDN Characterization of catalysts application of novel techniques Selective oxidation New catalytic aspects of heteropoly acids and related compounds Reaction of hydrocarbons Nontraditional catalytic materials Fuel upgrading Alkane activation Acid base catalysis New selective catalytic reactons fine chemicals Environmental catalysis Industrial catalysis deactivation reactivation Synthesis from syngas Electrocatalysis Photocatalysis The invited lectures and 433 papers included in these volumes present an update on all areas of catalysis and applications Engineering—An Endless Frontier Sunny Y. AUYANG, 2009-06-30 Genetic engineering nanotechnology astrophysics particle physics We live in an engineered world one where the distinctions between science and engineering technology and research are fast disappearing This book shows how at the dawn of the twenty first century the goals of natural scientists to discover what was not known and that of engineers to create what did not exist are undergoing an unprecedented convergence Sunny Y Auyang ranges widely in demonstrating that engineering today is not only a collaborator with science but its equal In concise accounts of the emergence of industrial laboratories and chemical and electrical engineering and in whirlwind histories of the machine tools and automobile industries and the rise of nuclear energy and information technology her book presents a broad picture of modern engineering its history structure technological achievements and social responsibilities its relation to natural science business administration and public policies Auyang uses case studies such as the development of the F 117A Nighthawk and Boeing 777 aircraft as well as the experiences of engineer scientists such as Oliver Heaviside engineer entrepreneurs such as Henry Ford and Bill Gates and engineer managers such as Alfred Sloan and Jack Welch to give readers a clear sense of engineering's essential role in the future of scientific research Table of Contents Preface 1 Introduction 2 Technology Takes Off 2 1 From Practical Art to Technology 2 2 Construction Becomes Mathematical 2 3 Experimenting with Machines 2 4

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