Diseño Plantas Para Ingenieros Químicos

Jaime Santillana Soto
Julia Salinas de Santillana
Ing. Químicos, M.S. in Chemical Engineering

Creación de Procesos

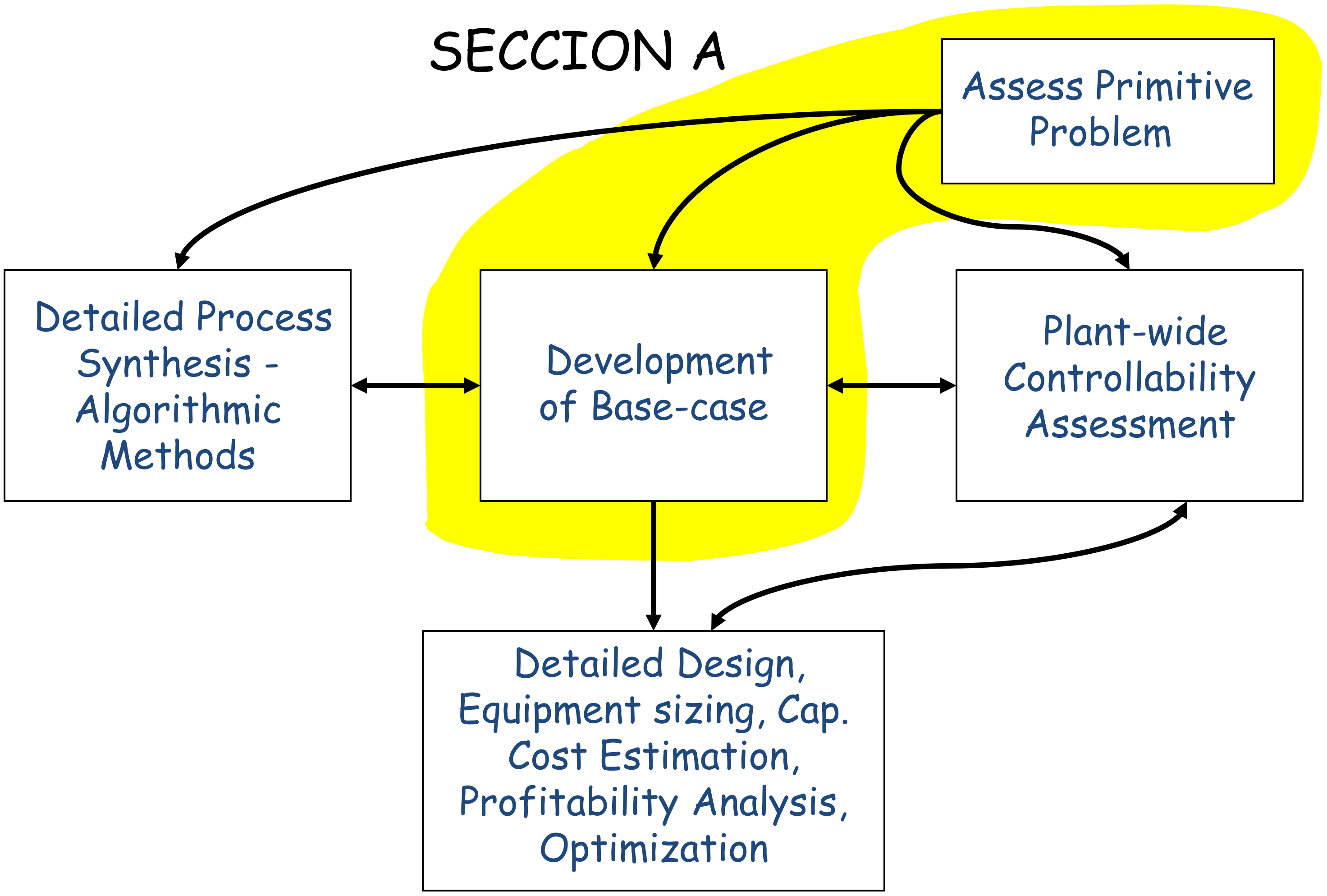
Proceso de Diseño

- **Problema Primitivo**
- **Etapas en el Diseño de Procesos Químicos**
  - ~~Evaluación Problema Primitivo~~
  - ~~Creación de Procesos:Métodos Heurísticos~~
  - Desarrollo del Caso Base
  - Síntesis de Procesos – Métodos Algorìtmicos
  - Evaluación Control Procesos
  - Diseño Detallado, Dimensionamiento, Estimación Costos, Optimizacion
  - Construccion, arranque y operación
- **Proteccion Ambiental**
- **Seguridad**

Diseño de Procesos

- Nace de la necesidad de producir rentablemente productos que satisfagan necesidades de la sociedad.: petroquímicos, productos de petróleo, gases industriales, alimentos, productos farmaceúticos, polímeros, plásticos, bioquímicos, etc.
- Muchos proyectos se relacionan con la adecuación de Plantas existentes a nuevas diversas regulaciones (medio ambiente, etc).
- Problemas de Diseño surgen de desarrollos de laboratorios de investigación. Químicos, bioquímicos e ingenieros investigan productos y procesos que satisfagan las necesidades de los consumidores y obtienen nuevos procesos y productos.
- Muchos productos(Teflon) han sido descubiertos por casualidad.
- En otros casos se tiene disponibilidad de materias primas a precios razonables (gas natural, maca, yakon, cochinilla, etc.)
- Otros problemas de diseño surgen cuando se desarrollan nuevos mercados.

Etapas en Diseño de Procesos



SECCION A

Assess Primitive Problem

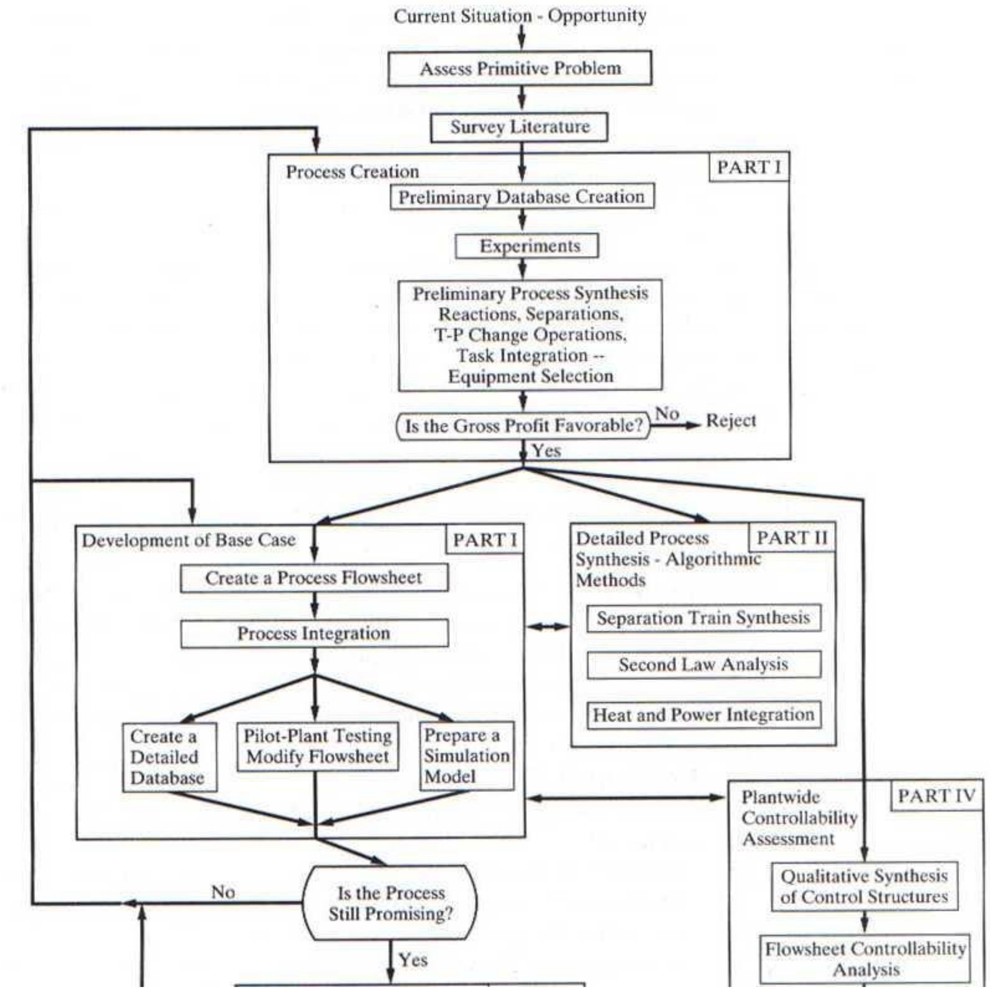
Detailed Process Synthesis - Algorithmic Methods

Development of Base-case

Plant-wide Controllability Assessment

Detailed Design, Equipment sizing, Cap. Cost Estimation, Profitability Analysis, Optimization

Etapas en Diseño de Procesos



Evalúe el Problema Primitivo

- El Proceso de Diseño empieza con un Problema Primitvo que expresa la ***situacion actual*** y da una ***oportunidad*** para satisfacer una **necesidad de la sociedad.**
- Se empieza la evaluación evaluando alternativas, refinando el problema y generando Problemas Específicos:
  - Materias Primas, se compran o manufacturan?.
  - La escala del proceso (se basa en la producción actual, en la demanda proyectada y en los precios de venta)
  - Localización para la planta
- Se refinan las evaluaciones tecnicas, económicas y de mercadeo.
- Se realiza una ***Tormenta de Ideas (Brainstorming)*** para generar alternativas.

Ejemplo: Manufactura etileno

Craqueo termico hidrocarburos

Pirolisis catalitica

Deshidrogenacion etano

Oxideshidrogenacion etano

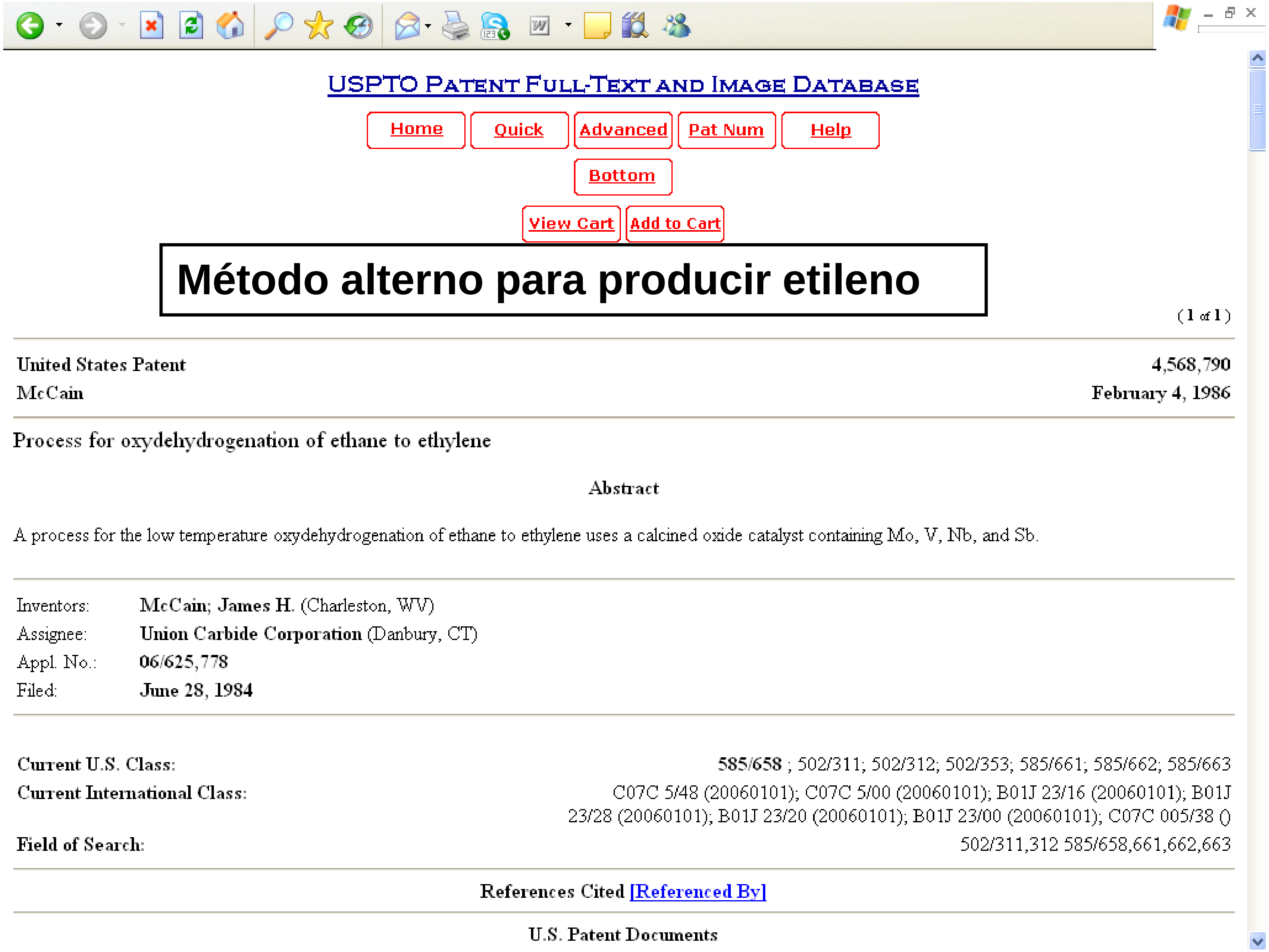
Copula oxidativa metano

Deshidatacion etanol

Fuentes de Información

- Reportes de Diseño SRI
- Enciclopedias
  - Kirk-Othmer Encyclopedia of Chemical Technology (1991)
  - Ullman’s Encyclopedia of Industrial Chemistry (1988)
- Handbooks y Libros de Referencias
  - Perry’s Chemical Engineers Handbook (1997)
  - CRC Handbook of Chemistry and Physics
- Indexes
- Patentes
- Internet

Método alterno para producir etileno



United States Patent	4,568,790
McCain	February 4, 1986

Process for oxydehydrogenation of ethane to ethylene

Abstract

A process for the low temperature oxydehydrogenation of ethane to ethylene uses a calcined oxide catalyst containing Mo, V, Nb, and Sb.

Inventors:	**McCain; James H.** (Charleston, WV)
Assignee:	**Union Carbide Corporation** (Danbury, CT)
Appl. No.:	**06/625,778**
Filed:	**June 28, 1984**

Current U.S. Class:	**585/658** ; 502/311; 502/312; 502/353; 585/661; 585/662; 585/663
Current International Class:	C07C 5/48 (20060101); C07C 5/00 (20060101); B01J 23/16 (20060101); B01J 23/28 (20060101); B01J 23/20 (20060101); B01J 23/00 (20060101); C07C 005/38 ()
Field of Search:	502/311,312 585/658,661,662,663

References Cited [Referenced By]

U.S. Patent Documents

Oxideshidrogenacion de etano a etileno

Low temperature oxydehydrogenation of ethane to ethylene has become well known since "The Oxidative Dehydrogenation of Ethane over Catalyst Containing Mixed Oxide of Molybdenum and Vanadium" by E. M. Thorsteinson,, Journal of Catalysis 52, pp. 116-132 (1978). The catalyst are active at temperatures as low as 200.degree. C. for the oxydehydrogenation of ethane to ethylene.

The effectiveness of the oxydehydrogenation of ethane to ethylene is determined by two parameters: conversion of ethane, and selectivity (efficiency) to ethylene.

U.S. Pat. No. 4,250,346 discloses catalytic oxydehydrogenation of ethane to ethylene at temperatures less than 550.degree. C. in which the catalyst is a calcined composition comprising the elements Mo, X, and Y , X=Cr, Mn, Nb, Ta, Ti, V, and/or.

U.S. Pat. No. 4,339,355 discloses a catalytic oxide of molybdenum, vanadium, niobium, and a fourth metal which is Co, Cr, Cu, Fe, In, Mn and/or Y. The patent discloses that the catalyst is suitable for the vapor phase catalytic oxidation of unsaturated aliphatic aldehydes to the corresponding saturated aliphatic carboxylic acid.

The present invention relates to a process for the low temperature catalytic oxydehydrogenation of ethane to ethylene in a gas phase and features the use of a catalyst having a calcined composition of Mo.sub.a V.sub.b Nb.sub.c Sb.sub.d wherein:

added to a second 200 ml of water and heated to 75° C. with stirring fof fifteen minutes. The second mixture was combined with the first mixture and the combination was heated at 75° C. with stirring for fifteen minutes. To a third 200 ml of water was added 70.6 grams (0.40 gram-atom of Mo) of ammonium paramolybdate. This mixture was heated to 75° C. with stirring for fifteen minutes and then added to the combined mixtures. The final mixtures was heated at 75° C. and stirred for fifteen minutes.

The resulting mixture was evaporated to dryness in air with stirring in steam-heated stainless steel evaporating dish. The resulting solid was broken and sieved to an 8×30 mesh and dried additionally in an oven at 120° C. for sixteen hours. The dried material was transferred to eight separate 50 cc beakers and calcined in an oven equipped with a blower at a temperature of 350° C. The temperature was raised from room temperature to 350° C. over a period of twenty minutes and thereafter held at 350° C. for five hours.

The catalyst was tested according to the above described test and the results are shown in Table I.

EXAMPLE 2

For comparison, the catalyst having a composition similar to the catalyst in Example 1 but without antimony was prepared and tested. The composition of this catalyst was:

$Mo_{0.71}V_{0.22}Nb_{0.07}$

The catalyst was prepared in accordance with the procedure used in Example 1 except that antimony oxalate was not included. The result of the test with this catalyst is presented in Table I.

EXAMPLE 3

A catalyst having the following composition was prepared:

$Mo_{0.70}V_{0.21}Nb_{0.07}Sb_{0.03}$

Ammonium metavanadate amounting to 7.24 grams (0.062 gram-atom of V) was added to 100 ml of water and heated to 75° C. for fifteen minutes. Niobium oxalate in the amount of 22.7 grams of a solution containing 11.3% by weight calculated as Nb_2O_5 (0.0192 gram-atom of Nb) and 1.36 grams of antimony (III) oxide (0.0093 gram-atom of Sb) were prepared in 100 ml of water and heated to 75° C. with stirring for fifteen minutes. The second mixture was combined with the first mixture and the combined mixture was heated at 75° C. with stirring for twenty minutes. Ammonium paramolybdate amounting to 35.3 grams (0.200 gram-atom of Mo) was added to 200 ml of water and this mixture was stirred and heated to 75° C. for fifteen minutes. Thereafter, the two mixtures were combined and the resulting mixture was heated at 75° C. and stirred for fifteen minutes. The drying, calcining, and evaluation were carried out as described in Example 1. The results are shown in Table 1.

EXAMPLE 4

A catalyst having the following composition was prepared:

$Mo_{0.71}V_{0.21}Nb_{0.07}Sb_{0.015}$

The procedures and amounts of the components were similar to what was carried out in Example 3 except that antimony (III) chloride (1.06 grams, 0.0047 gram-atom of Sb) was used. The results of the test with the catalyst is presented in Table I.

EXAMPLE 5

A catalyst having the same composition as the catalyst in Example 2 was prepared using half the amounts of each of the compounds and half the amounts of water for each solution. In accordance with Example 2, the dried material was calcined at a temperature of 350° C. The results of the test with this catalyst are given in Table I.

EXAMPLE 6

The catalyst of Example 5 was prepared except that the dried material was calcined at a temperature of 375° C. instead of 350° C. The results of the test with the catalyst are given in Table I.

EXAMPLE 7

The catalyst of Example 1 was prepared using the same procedure except that half the amount of the compounds and water were used. The dried solids were calcined at 350° C. and the results of tests with the catalyst are shown in Table I.

EXAMPLE 8

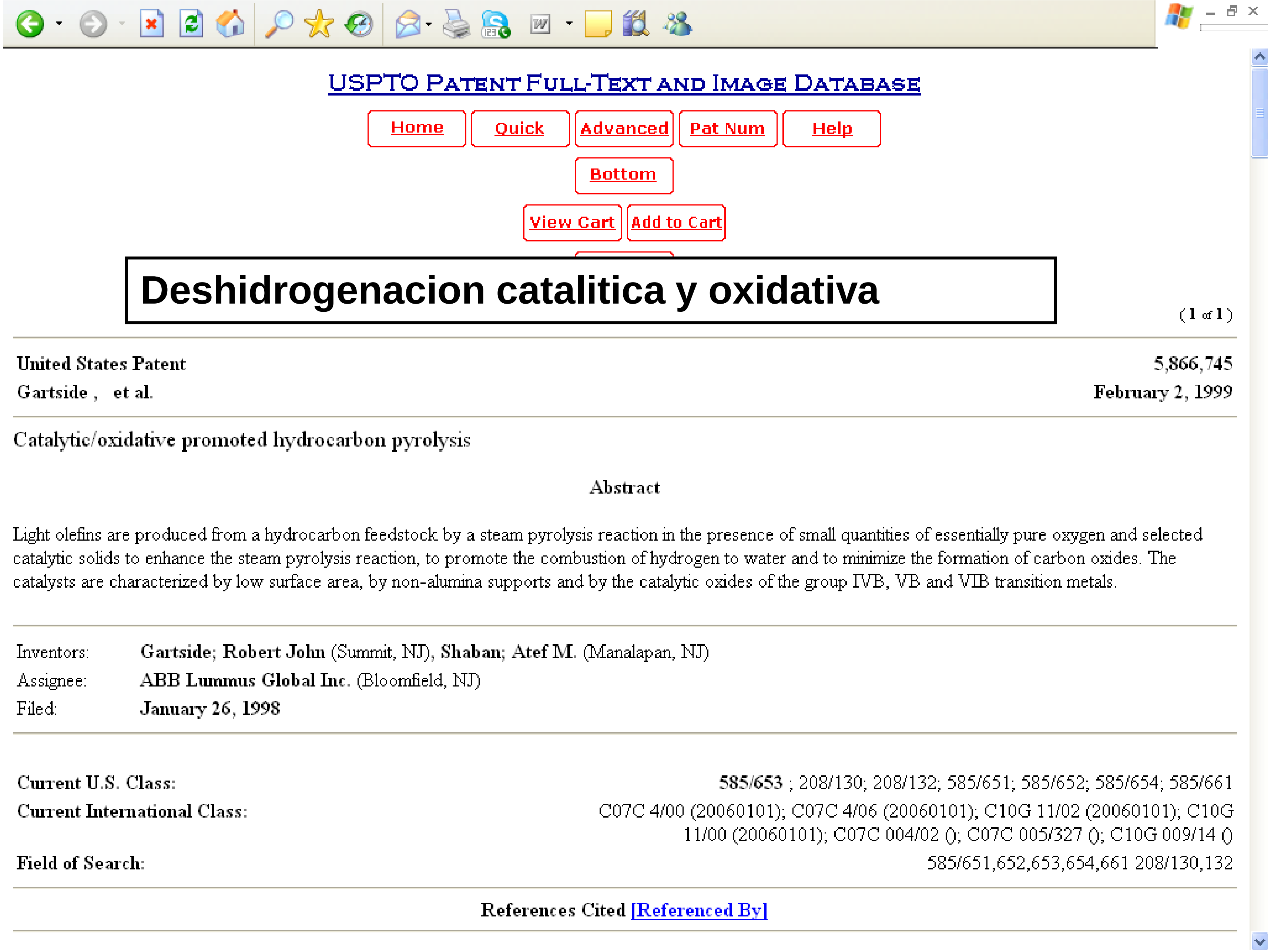
Example 7 was repeated except that the dried solids were calcined at a temperature 370° C. instead of 350° C. The results of the test with the catalyst are given in Table I.

TABLE I

Example No	Catalyst Composition	Temp °C.	Conversion of Ethane, %	Selectivity to Ethylene, %
1	$Mo_{.69}V_{.21}Nb_{.07}Sb_{.03}$	350	22	82
		375	31	80
		400	43	77
		425	57	72
2	$Mo_{.71}V_{.22}Nb_{.07}$	350	50	55
		375	58	51
		400	60	49
3	$Mo_{.69}V_{.21}Nb_{.07}Sb_{.03}$	350	20	73
		375	27	72
		400	40	67
4	$Mo_{.70}V_{.21}Nb_{.07}Sb_{.015}$	350	16	78
		375	24	77
		400	35	73
		415	46	68
5	$Mo_{.71}V_{.22}Nb_{.07}$	350	40	58
		375	54	52
6	$Mo_{.71}V_{.22}Nb_{.07}$	340	31	66
		400	56	52
7	$Mo_{.69}V_{.21}Nb_{.07}Sb_{.03}$	350	34	83
		375	36	81
		400	50	76
		425	63	71
8	$Mo_{.69}V_{.21}Nb_{.07}Sb_{.03}$	350	27	80
		375	38	78
		400	50	75
		425	62	70

Examples 1, 3, 4, 7 and 8 are according to the invention while the remaining Examples 2, 5 and 6 are prior art. Using the data of Examples 1, 3 and 4, the calculated selectivity to ethylene for a 50% conversion of ethane is 75%, 63% and 66%, respectively. Examples 7 and 8 show that a 50% conversion of ethane was measured to be selectivity of 76% and 75% respectively. It

Deshidrogenacion catalitica y oxidativa



United States Patent 5,866,745

Gartside , et al. February 2, 1999

Catalytic/oxidative promoted hydrocarbon pyrolysis

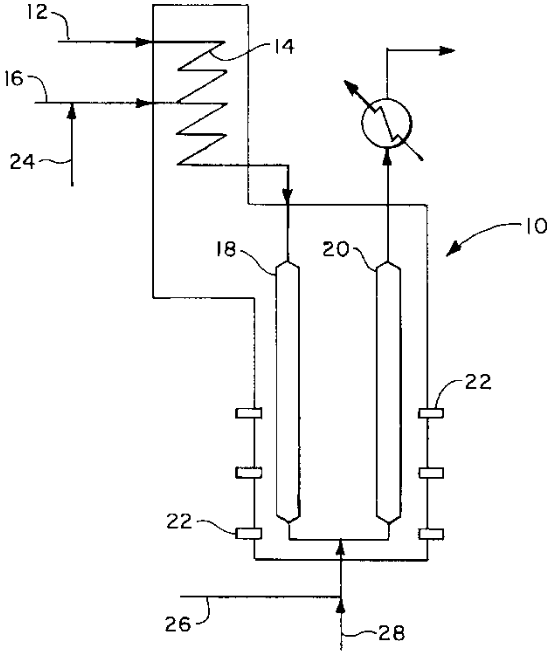
Abstract

Light olefins are produced from a hydrocarbon feedstock by a steam pyrolysis reaction in the presence of small quantities of essentially pure oxygen and selected catalytic solids to enhance the steam pyrolysis reaction, to promote the combustion of hydrogen to water and to minimize the formation of carbon oxides. The catalysts are characterized by low surface area, by non-alumina supports and by the catalytic oxides of the group IVB, VB and VIB transition metals.

Inventors:	**Gartside; Robert John** (Summit, NJ), **Shaban; Atef M.** (Manalapan, NJ)
Assignee:	**ABB Lummus Global Inc.** (Bloomfield, NJ)
Filed:	**January 26, 1998**

Current U.S. Class:	**585/653** ; 208/130; 208/132; 585/651; 585/652; 585/654; 585/661
Current International Class:	C07C 4/00 (20060101); C07C 4/06 (20060101); C10G 11/02 (20060101); C10G 11/00 (20060101); C07C 004/02 (); C07C 005/327 (); C10G 009/14 ()
Field of Search:	585/651,652,653,654,661 208/130,132

References Cited [Referenced By]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La manufactura del etileno sigue un proceso por radicales libres:

Iniciacion

Propagacion

Terminacion

Se producen múltiples componentes

US pto. 3,116,344. Reactor tubular para conversión de hidrocarburos

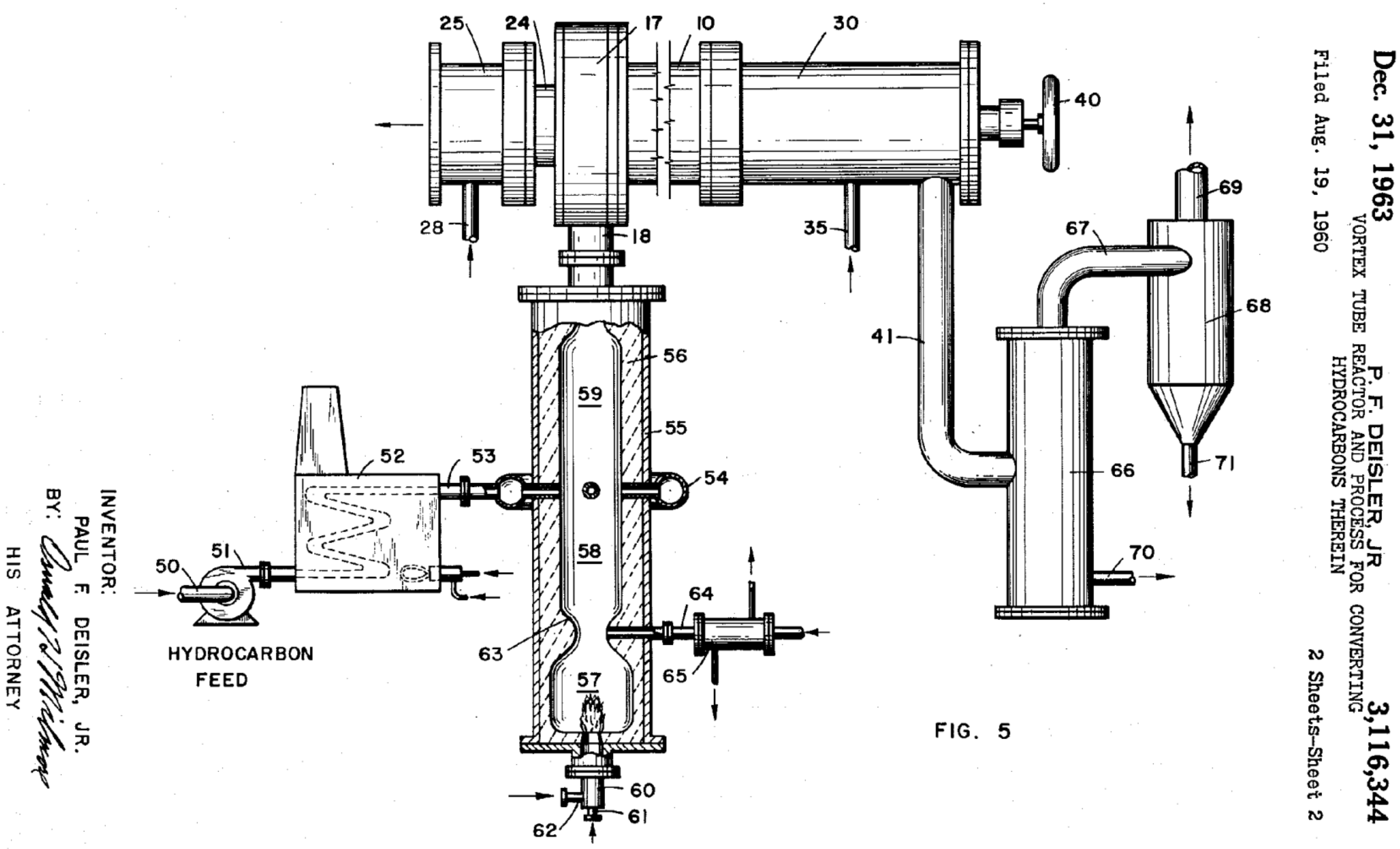

FIG. 5