

## REFERENCES:

1. Abdelaziz G, Ahmed A, Alain R, Robert H, Michel F, silica supported heteropoly acid promoted by Pt-Ce oxides in the isomerization of n-heptane, *Bull. Catal. Soc. India*, 7, 2008, 67-75.
2. Adeeva V, Haan DJW, Janchen J, Lei GD Schunemann V, Ven LMJ, Sachtler WHM, Santen RA, Acidic sites in sulphated and metal promoted Zirconia catalyst, *J. Catal.*, 151, 1995, 364-368.
3. Adzamic Z, Adzamic T, Muzic M, Bionda KS, Optimization of the n-hexane isomerization process using response surface methodology, *Chem. Eng. Res. and Des.* 91, 2013, 100-105.
4. Ahmad R, Melsheimer J, Jentoft FC, Schlogl R, Isomerization of n-butane and n-pentane in the presence of sulfated zirconia: Formation of surface deposits investigated by in-situ UV-vis diffuse reflectance spectroscopy. *J. Catal.*, 218, 2003, 365-374.
5. Arata K, Hino M, Solid catalyst treated with anion: XVIII. Benzoylation of toluene with benzoyl chloride and benzoic anhydride catalysed by solid superacid of sulfate-supported alumina, *Appl. Catal.*, 59(1), 1990, 197-204.
6. Argyle MD and Bartholomew CH, Heterogeneous catalyst deactivation and regeneration, *A Review Catalysts*, 5, 2015, 145-269.
7. Babou F, Coudurier G, Vedrine JC, Acidic properties of sulphated zirconia an infrared spectroscopy study, *J. Catal.*, 152, 1995, 341-349.
8. Baghbanzadeh M, Carbone L, Cozzoli PD, Kappe CO, Microwave-Assisted Synthesis of Colloidal Inorganic Nanocrystals, *Angew. Chem., Int. Ed.* 50, 2011, 11312-11359.
9. Barrera JA, Montoya P, Angel, Navarrete J, Cano ME, Tzompantzi F, Gaona LA, Surface properties of palladium catalysts supported on ternary  $ZrO_2-Al_2O_3-WO_x$  oxides prepared by the sol-gel method: Study of the chemical state of the support, *J. Phy. Chem. Solids*, 73, 2012, 1017–1025.
10. Bayati B, Ejtemaei M, Aghdam NC, Babaluo AA, Haghghi M, Sharafi A, Hydroisomerization of n-Pentane over Pt/Mordenite Catalyst: Effect of Feed

- Composition and Process Conditions, *Iran. J. Oil Gas Sci. Tech.*, 5 (2), 2016, 84-99.
11. Bian C, Zhang C, Pan Chen S, Zhang W, Meng X, Maurer S, Dai D, Parvulescu AP, Muller U, Xiao FS, Generalized high-temperature synthesis of zeolite catalysts with unpredictably high space-time yields (STYs); *J. Mat. Chem. A*, 5, 2017, 2613-2618.
  12. Bieletzki M, Hynninen T, Soini TM, Pivetta M, Henry CR, Foster AS, Esch F, Barth C, Heiz U, Topography and work function measurements of thin MgO (0 01) films on Ag (001) by NC-AFM and KPFM. *Phys. Chem. Chem. Phys.*, 12, 2010, 3203–3209.
  13. Bikmetova LI., Smolikov M.D, Zatolokina EV, Kazantsev KV, Tregubenko V, Yu, Belyi AS, Supported sulfated zirconia catalysts for isomerization of n-hexane; *Procedia Engineering* 152, 2016, 87-93.
  14. Bondioli F, Ferrari AM, Leonelli C, Siligardi C, Pellacani GC, *Microwave-Hydrothermal Synthesis of Nanocrystalline Zirconia Powders*, *J. Am. Ceram. Soc.*, 84, 2001, 2728-2730.
  15. Bondioli F, Leonelli C, Manfredini T, Ferrari AM, Caracoche MC, Rivas P C, Rodriguez AM., Microwave Hydrothermal Synthesis and Hyperfine Characterization of Praseodymium-Doped Nanometric Zirconia Powders, *J. Am. Ceram. Soc.*, 88, 2005, 633-638.
  16. Bustos M, Vera CR, Grau JM, Optimal process conditions for the isomerization cracking of long-chain n-paraffins to high octane isomerized gasoline over Pt/SO<sub>4</sub><sup>2-</sup>-ZrO<sub>2</sub> catalysts, *Fuel Proc. Tech.*, 92, 2011, 1675-1684.
  17. Bouiti R, Isomerisation d'alcanes légers sur catalyseurs acides bifonctionnels Pt-acides., Doctoral thesis, Université de Poitiers, France, 2003.
  18. Caeiro G, Carvalho RH, Wang X, Lemos MA, Lemos F, Gusinet M, Ribeiro FR, Activation of C<sub>2</sub>-C<sub>4</sub> alkanes over acid and bifunctional zeolite catalysts, *J. of mole. Catal. A: Chem.*, 255(1-2), 2006, 131-158.
  19. Camiloti AM, Jahn SL, Velasco ND, Moura LF, Cardoso D, Acidity of Beta zeolite determined by TPD of ammonia and ethylbenzene disproportionation, *Appl. Catal. A: Gen* 182, 1999, 107-113.

20. Carrier X, Lukinskas P, Kuba S, Stievano L, Wagner FE, Che M, Knozinger H, The state of the Iron promoter in tungstated zirconia catalyst, *Chem. Phys. Chem.*, 5, 2004, 1191- 1199.
21. Castillo ML, Salinas EL, Fripiat JJ, Valente JS, Beltran FH, Hernandez AR, Bolanos JN, *J. Catal.*, 200, 2003, 317.
22. Chao K, Wu H, Leu L, hydroisomerization of light normal paraffins over series of platinum loaded mordenite and beta catalyst, *Appl. catal. A: Gen.*, 143, 1996, 223-243.
23. Che M, Clause O, Marcilly C, Ertl G, Kneozinger H, Weitkamp J, (eds.): Handbook of Heterogeneous Catalysis, Vol. 1, Wiley-VCH, Weinheim, 191, 1997, 48.
24. Chen ER, Coudurier G, Joly JE, Vedrine JC, Super acid and catalytic properties of sulphated zirconia, *J. Catal.*, 143, 1993, 616-626.
25. Chen LF, Wang JA, Norena LE, Aguilera J, Navarette J, Salas P, Montoya JA, Del-Angel P, Synthesis and physicochemical properties of Zr-MCM-41 mesoporous molecular sieves and Pt/H3PW12O40/Zr-MCM-41 catalysts, *J. of sol. St. chem.*, 180(10), 2007, 2958-2972.
26. Chen XR, Chen CL, Xu NP, Mou CY, Al and Ga promoted tungstated zirconia catalyst for n-butane isomerization, *Catal. Letter*, 85, 2003, 177-182.
27. Chen XR, Du YO, Chen CL, Xu NP, Mou CY, Highly active and stable n-pentane isomerization catalysts without noble metal containing: Al or Ga promoted tungstated zirconia, *Catal. Lett.* 111(3-4), 2006, 187-193.
28. Chen XR, Chen CL, Xu NP, Mou CY, Al and Ga promoted  $\text{WO}_3/\text{ZrO}_2$  strong solid acid catalysts and their catalytic activities in n-butane isomerization, *Catal. Today.*, 93-95, 2004, 129-134.
29. Chigier NA, Energy, combustion and the environment. New York: McGraw Hill. (1981).
30. Chimienti ME, PizzioLR, Caceres CV, Blanco MN, Tungstophosphoric and tungstosilicic acids on carbon as acidic catalysts *Appl. Catal. A: Gen.*, 208, 2001, 7-19.
31. Chintaparty R, Reddy R, Nagireddy P, Reddy S, Synthesis and characterization of monoclinic phase of zirconia, *J Aust Ceram Soc.* 53, 2017, 29-31

32. Chintaparty R, Reddy R, Effect of precursor on optical, dielectric properties of zirconia crystalline powder prepared by hydrothermal method, *Adv. Mater. Lett.*, 7(3), 2016, 235-238.
33. Chu P, Dwyer FG, Vartuli JC, US Patent, 4778666, 1988.
34. Claude MC and Martens JA, Monomethyl branching of long n-alkanes in the range from decane to tetracosane on Pt/HZSM-22 bi-functional catalyst, *J. of Catal.*, 190 (1), 2000, 39-48.
35. Coats AW, Redfern JP, Thermogravimetric Analysis: A Review, *Analyst*. 88, 1963, 906–924.
36. Coelho MA, Resasco DE, Sikabwe EC, White RL, Modification of the catalytic properties of sulphated zirconia by addition of metal promoters, *Catal. Letters*, 32(3-4), 1995, 253-262.
37. Collins MJ, Future trends in microwave synthesis, *Jr. Future Med. Chem.*, 2, 2010, 151.
38. Comelli RA, Vera CR, Parera JM, Influence of zirconia crystalline structure and sulphated ion concentration on the catalytic activity of Sulphated zirconia, *J. Catal.*, 151, 1995, 96-101.
39. Coronado E, Gomez-Garcia CJ, Polyoxometalate-based molecular materials. *Chem. Rev.*, 98, 1998, 273-296.
40. Corma A, Fornes V, Juanrajadell MI, Nieto JML, Influence of preparation condition on the structure and catalytic properties of sulphated zirconia superacid catalysts, *Appl. Catal. A: Gen.*, 116, 1995, 151-163.
41. Cundy CS, Forrest JO, Plaisted RJ, Some observations on the preparation and properties of colloidal silicalites. Part I: synthesis of colloidal silicalite-1 and titanosilicalite-1 (TS-1), *Micro. Meso. Mater.*, 66(2-3), 2003, 143-156.
42. Dar BA., Ahmad N, Patiala J, Sharma P, Bindu K, Maity S, Singh B, Sulfated zirconia as an efficient heterogeneous and reusable catalyst for one pot synthesis of flavanones, *J. Sau Chem. Soc.*, 18 , 2014, 464-468.
43. Davis BH, Keogh RA, Srinivasan R, Sulfated zirconia as a hydrocarbon conversion catalyst, *Catal. Today*, 20, 1994, 219-256.

44. Delmon B, Ertl G, Kneozinger H, Weitkamp J, (eds.): *Handbook of Heterogeneous Catalysis*, Vol. 1, Wiley-VCH, Weinheim 1997, 264.
45. Delporte P, Pham HC, Ledoux MJ, Effect of the reaction temperature and hydrocarbon partial pressure on the activity of carbon-modified MoO<sub>3</sub> for n-hexane isomerization. *Appl. Catal. A: Gen.*, 149, 1997, 151-180.
46. Demirbas A, Alidrisi H, Balubaid M, A. API gravity, sulfur content and desulfurization of crude oil. *Pet. Sci. Tech.*, 33, 2015a, 93-101.
47. Demirbas A, Fuels from petroleum, coal and biomass. *Energy Educ. Sci. Tech. A*: 29, 2012, 701-705.
48. Deshmane VG, Adewuyi YG, Mesoporous nanocrystalline sulphated zirconia synthesis and its application for FFA esterification in oils, *Appl. Catal. A: Gen.*, 462, 2013, 196-206.
49. Dhar A, Vekariya RL, Sharma P, Kinetics and mechanistic study of n-alkane hydroisomerization reaction on Pt-doped g-alumina catalyst, *Petroleum*, 2017 1-8.
50. Dhodapkar, Shrikant V, Klinzing, George E, Zaltash, Abdolreza, A primer on gas-solids fluidization, *Chem. Eng. Acad. One file*, 2012: 38-47.
51. Dou X, Mohan D, Pittman CU, Yang S, remediating fluoride from water using hydrous zirconium oxide, *Chem. Eng. J.*, 198-199 2012, 236-245.
52. Ebitani K, Konishi J, Horie A, Hattori H, Tanabe K, Tanabe K, Hattori H, Yamaguchi T, Tanaka T, Eds. *Acid base catalysis*, Kodansha, Tokyo, 1989, 491-498.
53. Ebitani K, Konishi J, Horie A, Tsuji J, Hattori H, Kita H, Dynamic modification of surface acid properties with hydrogen molecules for zirconia oxide promoted by Pt and sulphated, *J. Catal.*, 135, 1992, 609- 614.
54. Enriquez JMH, Lajas LA, Alamilla RG, Martin EAS, Alamilla PG, Handy EB, Galindo GC, Serrano LAG, Synthesis of solid acid catalysts based on TiO<sub>2</sub>-SiO<sub>2</sub> and Pt/ TiO<sub>2</sub>-SiO<sub>2</sub> applied in n-Hexane Isomerization, *Open J. of metal*, 3, 2013, 34-44.
55. Enriquez JMH, effect of the addition of phosphotungstic acid on the thermal stability of zirconium oxide, 81(183), 2014, 107-114.

56. Enriquez JMH, Rodrigo RS, Alamilla RG Serrano LAG, Handy BE, Galindo GC, Hernandez AC, Synthesis and physico chemical characterization of CeO<sub>2</sub>/ZrO<sub>2</sub>–SO<sub>4</sub><sup>2-</sup> mixed oxides, *J. Mex. Chem. Soc.*, 56(2), 2012, 115-120.
57. Essayem N, Taarit VB, Feche C, Gayraud PY, Sapaly G, Naccache C, Comparative study of n-pentane isomerization over solid acid catalysts, heteropoly acids, sulphated zirconia and amordenite.: dependence on Pt and hydrogen addition, *J. Catal.*, 219(1), 2003, 97-106.
58. Feller A, Lercher JA, Chemistry and technology of isobutane/alkene alkylation catalyzed by liquid and solid acids. *Adv in Catal.*, 48, 2004, 229-295.
59. Fogash KB, Hong Z, Kobe JM, Dumesic JA, Deactivation of sulfated zirconia and H-mordenite catalysts during n-butane and isobutane isomerization. *Appl. Catal. A: Gen.*, 172, 1998, 107-16.
60. Fulton JM, reactor design for chem engg. 7 July, 1986, 59.
61. Funamoto T, Nakagawa T, Segawa K, Isomerization of n-butane over sulphated zirconia catalyst under supercritical condition, *Appl. Catal. A: Gen.*, 286, 2005, 79-84.
62. Gabriel C, Gabriel S, Grant EH, Halsted BSJ, Mingos DP, Dielectric parameters relevant to microwave dielectric heating *Chem. Soc. Rev.*, 27, 1998, 213-324.
63. Galadima A, Anderson JA, Wells RPK, Solid acid catalyst in heterogeneous n-alkanes hydroisomerization for increasing octane number of gasoline, *SWJ*, 4(3), 2009, 15-22.
64. Gao Z, Xia YD, Hua WM, Miao CX, New catalyst of Sulphated alumina-zirconia for n-butane isomerization, *Topics in Catal.*, (1-4), 1998, 101- 106.
65. Garcia TE, Barranco PA, Ramos VC, Fuentes GA, Thermal and structural characterization of the ZrO<sub>2-x</sub>(OH)<sub>2x</sub> to ZrO<sub>2</sub> transition. *J. Mater. Res.*, 16, 2001, 2209-2212.
66. Gawthrope DE, Lee AF, Wilson K, Physicochemical properties of Pt-SO<sub>4</sub>/Al<sub>2</sub>O<sub>3</sub> alkane oxidation catalysts *Phy. Chem. Chem. Phys.*, 6, 2004, 3907-3914.
67. George AO, William ST, Robert EA, Friedel-Crafts Isomerization, Effect of promoted aluminum halides on halobenzenes. *J. Org. Chem.*, 27 (10), 1962, 3441–3449.

68. Gharibeh M, Tompsett GA, Conner WC, Microwave Reaction Enhancement: The Rapid Synthesis of SAPO-11 Molecular Sieves *Top. Catal.*, 49, 2008, 157-166.
69. Gheno SM, Gonzalez EAU, conversion of n-butane to iso-butene on gallium/HZSM-5 catalysts, *Brazilian J. Chem. Eng.*, 19(03), 2002, 335-342.
70. Gherib A, Aouissi A, Rives A, Fournier M, Hubaut R, Isomerization of n-hexane over silica supported heteropoly oxometallates promoted by Pt-Ce xides, *Chin. J. Catal.*, 28(12), 2007, 1041–1046.
71. Gondaliya MB, Maheta T, Mamtora MJ, Shah MK, Reusable nanocatalyst: Zirconia and sulfated zirconia, *Int. Lett. Chem. Phys. Astro.*, 17(3), 2014, 295-302.
72. Gonzalez MR, Fogash KB, Dumesic JA, Promotiom of n-butane isomerization activity by hydration of sulphated zirconia, *J. Catal.*, 160, 1996, 290-298.
73. Gonzalez MR, Fogash KB, Kobe JM, Dumesic JA, Promotion of n- butane isomerization by hydroxyl group on sulphated zirconia, *Catal. Today*, 33, 1997, 303-312.
74. Gopal S, Smirniotis PG, Pt/H-ZSM-12 as a catalyst for the hydroisomerization of C5–C7 n-alkanes and simultaneous saturation of benzene *Appl. Catal. A: Gen.*, 247, 2003, 113-123.
75. Gouzerh P, Proust A, Main group element, organic, and organometallic derivatives of polyoxometalates, *Chem. Rev.* 98, 1998, 77-112.
76. Gowri S, Gandhi RR, Sundrarajan M, Structural, optical, antibacterial and antifungal properties of zirconia nanoparticles by biobased protocol, *J. Mater. Sci. Technol.*, 30(8), 2014, 782-790.
77. Graeme S, Ross J, Annual meeting of national petrochemical and refiners association; March 21–23, 2004.
78. Gregg SJ, Sing KSW, Adsorption, surface area and porosity 2nd ed. (Academia Press, London), 1982, 195.
79. Griffiths P, Hasseth JA, (2007), Fourier Transform Infrared Spectrometry (2nd ed.). Wiley-Blackwell. ISBN 0-471-19404-2.
80. Grinenval E, Garron A, Lefebvre F, Butane isomerization over silica supported heteropolyacids: study of some parameters, *J. Catal.*, 2013, 2013, 8. <http://dx.doi.org/10.1155/2013/828962>.

81. Guemini M, Rezgui Y, Effect of pretreatment conditions on the catalytic performance of Ni-Pt-W supported on amorphous silica-alumina catalysts Part 2. Catalysts prepared by a hybrid method, *Appl. Catal. A: Gen.*, 345, 2008, 164-175.
82. Guisnet M, Bichon PH, Gnepp NS, Essayem N, Transformation of propane, n-butane and n-hexane over H<sub>3</sub>PW<sub>12</sub>O<sub>40</sub> and cesium salts. Comparison to sulfated zirconia and mordenite catalysts, *Topics in Catal.*, 11(12), 2000, 247-254.
83. Guisnet M, Catalysis on bifunctional Pt acid Zeolites. A route to cleaner processes *Pol. J. Chem.*, 77, 2003, 637-656.
84. Guo C, Yao S, Cao J, Qian Z, Alkylation of isobutene with butenes over super solid acids, SO<sub>4</sub><sup>2-</sup>/ZrO<sub>2</sub> and SO<sub>4</sub><sup>2-</sup>/TiO<sub>2</sub>. *Apl. Catal. A: Gen.*, 107, 1994, 229-238.
85. Haridas S, Deepa C, Rani SK, Sugunan S, Influence of sulphate content on the physico-chemical properties and catalytic activity of some sulphated zirconia systems, *Ind. J. Chem.*, 42, 2003, 1840-1849.
86. Hayashi H, Hakuta Y, Hydrothermal synthesis of metal oxide nanoparticles in supercritical water, *Materials*, 3, 2010, 3794-3817.
87. Heshmatpour F, Aghakhanpour RB, Synthesis and characterization of superfine pure tetragonal nanocrystalline sulphated zirconia powder by a non-alkoxide sol-gel route, *Adv. Powder Technol.* 23, 2012, 80-87.
88. Hino M and Arata K, Preparation of superacid of iron-supported zirconia for reaction of butane to isobutene, *Catalysis Letters*, 36 (3-4) 34, 1996, 125-128.
89. Hino M, Arata K, Solid catalyst treated with anion. 2. Reactions of butane and isobutane catalyzed by zirconium oxide treated with sulfate ion. Solid superacid catalyst *J. Am. Chem. Soc.*, 101, 1979, 6439-6441.
90. Hino M, Arata K, Synthesis of solid super acid catalyst with acid strength of H<sub>0</sub> < -16.04. *J. Chem. Soc. Chem. Commun.*, 1980, 851-852.
91. Hoang DL, Lieske, H, Temperature-programmed reduction study of chromium oxide supported on zirconia and lanthana-zirconia, *Thermochimica Acta*, 345, 2000, 93-99.
92. Holm VCF and Bailey GC, US Patent No. 3032599, 1962.
93. Hubaut R, Tayeb BBO, Kuang W, Rives A Fournier M, mechanical mixture of Me ( Ni, Pd) Ce oxides and silica supported heteropoly acids: Role and optimal

- concentration of each active species in n- hexane isomerization, *kinetic and Catal.*, 47(1), 2006, 20-24.
94. Iglesia E, Soled SL, Kramer GM, Isomerization of Alkanes on Sulfated Zirconia: Promotion by Pt and by Adamantyl Hydride Transfer Species, *J. Catal.*, 144, 1993, 238-253.
95. Ivanov AV, Vasina TV, Nissenbaum VD, Kustov LM, Timofeeva MN, Houzvicka JI, Isomerization of n-hexane on the Pt-promoted Keggin and Dawson tungstophosphoric heteropoly acids supported on zirconia, *Appl. Catal. A: Gen.*, 259, 2004, 65-72.
96. Izumi Y, Ogawa M, Nohara W, Krabe K, Acidic alkali metal salts and ammonium salts of Keggin-type heteropolyacids as efficient solid acid catalysts for liquid-phase Friedel-Crafts Reactions. *Chem. Lett.* 1992, 1987-1990.
97. Jentoft FC, Hahn A, Krohner J, Lorenz, Gisela, Jentoft RE, Ressler T, Wild U, Schlogl R, Hassner C, Kohler K, Incorporation of manganese and iron into the zirconia lattice in promoted sulphated zirconia catalyst, *J. Catal.*, 224(1), 2004, 124- 137.
98. Jhung SH, Chang JS, Hwang JS, Park SE, Effect of acidity and anions on synthesis of AFI molecular sieves in wide pH range of 3–10, *Micro. Meso. Mater.*, 67, 2004, 151-157.
99. Jin H, Ansari MB, Park SE, Microwave Synthesis of Mesoporous MFI Zeolites, *Adv. Porous Mater.*, 1, 2013, 72-90.
100. Jun JW, Lee JS, Seok HY, Chang JS, Hwang JS, Jhung SH, A Facile Synthesis of SAPO-34 Molecular Sieves with Microwave Irradiation in Wide Reaction Conditions *Bull. Korean Chem. Soc.*, 32, 2011, 1957-1964.
101. Khalid A, Majnouni A, Yun JH, Lobo RF, High temperature produced catalytic sites selective for n-alkane dehydrogenation in acid zeolites: The case of HZSM-5, *Hem. Cat. Chem.*, 3, 2011, 1333-1341.
102. Kim DS, Chang JS, Hwang JS, Park SE, Synthesis of zeolite beta in fluoride media under microwave irradiation, *Micro. Meso. Mater.*, 68, 2004, 77-82.
103. Kimura T, Development of Pt/SO<sub>4</sub><sup>2-</sup>/ZrO<sub>2</sub> catalyst for isomerization of light naphtha *Catal. Today*, 81, 2003, 57-63.

- 104.Ko EI, Ertl G, Knozinger H, Weitkamp J, (eds.): *Handbook of Heterogeneous Catalysis*, Vol. 1, Wiley-VCH, Weinheim 1997, 86.
- 105.Kourieh R, Rakic V, Bennici S, Auroux A, Relation between surface acidity and reactivity in fructose conversion into 5-HMF using tungstated zirconia catalyst; *Catalyst communication*, 30, 2013, 5-13.
- 106.Kozhevnikov IV, catalysis by heteropoly acid and multicomponent poly oxy metalates in liquid-phase reaction, *Chem. Review*, 98, 1998, 171-198.
- 107.Kozhevnikov, IV; Sustainable heterogeneous acid catalysis by heteropoly acid, *J. Mol. Catal. A: Chem.*, 262, (1-2), 2007, 86-92.
- 108.Kuang W, Rives A, Tayeb BBO, Fournier M, Hubaut R, Isomerization of n-hexane over silica-supported heteropoly acids promoted by the reduced Ce-Ni oxides, *J. Colloid Interface Sci.* 248(1), 2002, 123-129.
- 109.Kumar A, S. Singhal, S. Agarwal, Badoni, R P., Reddy KM., Synthesis and characterization of SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>composite: Structural and surface properties, *J. of chem. phar. res.* 7(12), 2015, 328-335.
- 110.Kuba S, Heydorn PC, Grasselli RK, Gates BC, Che M, Knozinger H, Redox properties of tungstated zirconia catalysts: Relevance to the activation of n-alkanes, *Phys.. Chem. Chem. Phys.* 3, 2001, 146-154.
- 111.Kumbhar PS, Yadav VM, Yadav GD, *Chem. Mod. Surf.*, 3, 1990, 81-92.
- 112.Kustov LM, Kazansky VB, Figueras F, Tichit D, Investigation of the Acidic Properties of ZrO<sub>2</sub> Modified by SO<sub>2</sub>-4 Anions, *J. Catal.* 150, 1994, 143-149.
- 113.Laha SC, Kamalakar G, Glaser R, Microwave-assisted synthesis of [Cr] APO-5, *Micro. Meso. Mater.*, 90, 2006 45.
- 114.Larsen G, Petkovic LM, Effect of preparation method and selective poisoning on the performance of platinum supported on tungstated zirconia catalysts for alkane isomerization, *Appl. Catal.*, 148, 1996, 155-166.
- 115.Lee KY, Misono M, Ertl G, Knozinger H, Weitkamp J. (eds.): *Handbook of heterogeneous catalysis*, Vol. Wiley-VCH, Weinheim 1997, 118.
- 116.Lei T, Xu JS, Gao Z, Acidity enhancement of H-mordenite by sulphation. *Mat. Chem. Phy.*, 60(2), 1999, 177-181.

- 117.Li X, Yang J, Liu Z, Asami, K, Fujimoto K, Selective hydro conversion of n-heptane over Pd-supported Zeolites and Pd-containing hybrid catalyst, *J. of Japan Petro, Inst*, 49(2), 2006, 86-90.
- 118.Lin S, Yu J, Li J, Xu R, Sharma RP, Fabrication of SAPO-34 Crystals with Different Morphologies by Microwave Heating *Top. Catal.*, 53(19-20), 2010, 1304-1310.
- 119.Lucas DA, Valverde JL, Sanchez PDF, Ramos MJ, Hydroisomerization of n-octane over platinum catalysts with or without binder, *Appl. Catal.* 282, 2005, 15-24.
- 120.Lucas DA, Valverde JL, Sanchez PD, Ramos MJ, Influence of the binder on the n-octane hydroisomerization over palladium containing zeolite catalysts, *Inds. Eng. Chem. Res.*, 43, 2004, 8217-8225.
- 121.Lukinskas P, Kuba S, Spliethoff B, Grasselli RK, Tesche B, Knozinger H, Role of Promoters on Tungstated Zirconia Catalysts, *Topic in catalysis*, 23(1-4), 2003, 163-173.
- 122.Macilli CR, zeolite in the petroleum industry, *Encyclopedia of suparamolecular chemistry*, 2004.
- 123.Manuel J, Enriquez H, effect of the addition of phosphotungstic acid on the thermal stability of zirconium oxide; 81, 2014, 107-114.
- 124.Martens JA, Vanbutsele G, Jabobs PA, Denayer J, Ocakoglu R, Baron G, Arroyo JMA, Thybaut J, Marin GB, Evidences for pore mouth and key-lock catalysis in hydroisomerisation of long n-alkanes over 10-ring tubular pore bi-functional zeolites, *Catal. Today*, 62(2-4), 2001, 111-116.
- 125.Mary TA, Mukunthan A, zirconia-sol-gel process, International Journal of Computer & Organization Trends, 2(1), 2012
- 126.Mao RLV and Saberi MA, Catalysts for hydroisomerisation of n-heptane, prepared according to the concept of triangular configuration (acid/metal/desorption transfer promoting sites), *Appl. Catal. A: Gen.*, 199(1), 2000, 99-107.
- 127.Mendes G, Aleme HG, Barbeira PJS, Determination of octane numbers in gasoline by distillation curves and partial least squares regression. *Fuel* 97, 2012, 131-136.
- 128.Miao CX., Hua WM., Chen JM, Gao Z., Sulfated binary and trinary oxide solid super acids. *Science in china series b-chemistry*, 39(4), 1996, 406-415.

129. Miao, Z., D. Y. Wang, and C. H. Wang, Elementary assessment for organochlorine pollution in Dan-Jiang-Kou Reservoir, Express Water Resources & Hydropower Information 18(15), 1997, 13-17.
130. Mills GA, Heinemann H, Millikan TH, Oblad AG, Houdriforming Reactions Catalytic Mechanism, *Ind. Eng. Chem.* 45, 1953, 134-137.
131. Mishra HK and Parida KM, studied on sulphated zirconia: synthesis, physico chemical characterization and n-butane isomerization activity, *Appl. Catal. A: Gen.*, 224, 2002, 179-189.
132. Mishra MK, Tyagi B, Jasra RV, Synthesis and characterization of nano-crystalline sulphated zirconia by sol-gel method, *J. Mol. Catal. A: Chem.* 223, 2004, 61-65.
133. Misono M, Heterogeneous catalysis by heteropoly compounds of molybdenum and tungsten, *Catal. Rev. Sci. Eng.*, 30, 1988, 339.
134. Miyamoto Y, Katada N, Niwa M, Acidity of beta zeolite with different Si/Al<sub>2</sub>O<sub>3</sub> ratio as measured by temperature programmed desorption of ammonia, *Micro. Meso. Mater.*, 40, 2000, 271-281.
135. Moffat JB, Metal-Oxygen Clusters, Kluwer academic/Plenum publishers, New York 2001.
136. Moreno JA and Poncelet G, Isomerization of n-butane over sulphated Al-and Ga promoted zirconium oxide catalyst: Influence of Promoter and preparation method, *J. Catal.* 203, 2001, 453-465.
137. Morterra C, Cerrato G, Ciero DS, Signoretto M, Pinna F, Strukul G, Platinum promoted and unpromoted sulphated zirconia catalyst prepared by one step aerogel procedure:1, physico chemical and morphological characterization, *J. Catal.*, 165, 1997, 172-183.
138. Morterra C, Cerrato G, Emanuel C, Boils V, On the Surface Acidity of Some Sulfate-Doped ZrO<sub>2</sub> Catalysts *J. Catal.*, 142, 1993, 349-367.
139. Morterra C, Cerrato G, Pinna F, Signoretto M, Bronsted acidity of superacid sulphate dopped ZrO<sub>2</sub> system, *J. Phy. Chem.*, 98, 1994, 12373-12381.
140. Morterra C, Cerrato G, Pinna F, Signoretto M, Strukul G, On the acid catalyzed isomerization of light parafins over a SO<sub>4</sub><sup>2-</sup>/ ZrO<sub>2</sub> system: the effect of Hydration, *J. Catal.*, 149, 1994, 181-188.

141. Morterra C, Giamello E, Orio L, Volante M, Formation and reactivity of zirconium (3+) centre at the surface of vacuum- activated monoclinic zirconia, *J. Phy. Chem.*, 94, 1990, 3111-3116.
142. Mukherjee M, Nehlsen J, Consider catalyst developments for alkylation production, *Hydrocarbon Processing*, 85(9), 2006, 85-85.
143. Munoz TA, Sastre E, Alvarez CM, Microwave-assisted synthesis of plate-like SAPO-34 nanocrystals with increased catalyst lifetime in the methanol-to-olefin reaction, *Catal. Sci. Tech.*, 4, 2014, 4330-4339.
144. Na K, Okuhara T, Misono M, Skeletal isomerization of n-butane over caesium hydrogen salts of 12-tungstophosphoric acid *J. Chem. Soc. Faraday Trans.* 91, 1995, 367-373.
145. Nascimento P, Akratopoulou C, Oszagyan M, Coudurier G, Travers C, Joly JF, Vedrine JC, *Study surface science, Catalysis*, 75, 1993, 1197.
146. Nieminen V, Kangas M, Salmi T, Murzin DY, Kinetic study of n-butane isomerization over Pt-H-mordenite, *Industrial and Engineering Chemistry Research*, 44, 2005, 471-484.
147. Nikita V, Chekantsev, Maria S, Gyngazova, Emilia DI, Mathematical modeling of light naphtha (C<sub>5</sub>, C<sub>6</sub>) isomerization process *Chemical Engineering Journal*, 238, 2014, 120-128.
148. Niwa M, Habuta Y, Okumura K, Katada N, Solid acidity of meta Oxide monolayer and its role in catalytic reaction, *Catal. Today*, 87, 2003, 213-220.
149. Nuuchter M, Ondruschka B, Bonrath W, Gum A, Microwave assisted synthesis – a critical technology overview *Green Chem.*, 6, 2004, 128-141.
150. Okuhara T, Yamashita M, Na K, Misono M, Alkylation of isobutane with butenes catalyzed by a cesium hydrogen salt of 12-tungstophosphoric acid. *Chem. Lett.*, 1994, 1451-1454.
151. Okamoto Y, Kubota T, Ohto Y, Nasu S, Metal oxide support interection in Fe/ZrO<sub>2</sub> catalyst, *J. Phys. Chem. B.*, 104, 2000, 8462-8470.
152. Olaf Deutschmann, Helmut Knozinger, Karl kochloef, Heterogeneous Catalysis and Solid Catalysts, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 10.1002/14356007.a05\_313.pub2.

- 153.Olindo , Pinna F, Strukul G, Canton P, Riello P, Cerrato G, Meligrana G, Morterra C, Al<sub>2</sub>O<sub>3</sub> promoted sulphated zirconia catalyst for the isomerization of n-butane, *Study surface sciences catalysis*, 130, 2000, 2375-2380.
- 154.Oliveira KD, Santana RC, Avila-Neto CAN, Cardoso D, Isomerization of n-hexane with Pt/Ni-based catalysts supported on Al-rich zeolite Beta and correlation with acidity and oxidation state of metal crystallites, *Appl. Catal. A: Gen.* 495, 2015, 173-183.
- 155.Ono Y, A survey of the mechanism in catalytic isomerization of alkanes, *Catalysis Today*; 81(1), 2003, 3-16.
- 156.Ono Y, A survey of mechanism in catalytic isomerisation of alkanes. *Catalysis Today*, 81, 3-16., 44(24), 9050-9058.
- 157.Parera, JM, Promotion of zirconia acidity by addition of sulphate ion, *Catal. Today*, 15 (3-4), 1992, 481- 490.
- 158.Patel A, Coudurier G, Essayem N, Vedrine JC, Effect of the addition of Sn to zirconia on the acidic properties of the sulfated mixed oxide, *J. Chem. Soc., Faraday Trans.*, 93(2), 1997, 347-353.
- 159.Patra AK, Das SK, Bhaumik A, Self-assembled mesoporous TiO<sub>2</sub> spherical nanoparticles by a new templating pathway and its enhanced photoconductivity in the presence of an organic dye. *J. Mater. Chem.*, 21, 2001, 3925-3930.
- 160.Pinto T, Dufaud V, Lefebvre F, Isomerization of n-hexane on heteropolyacids supported on SBA-15.1: Monofunctional impregnated catalysts, *Appl. Catal. A: Gen.*, 483, 2014, 103-109.
- 161.Radwan D, Saad L, Mikhail S, Selim SA, Catalytic evaluation of sulphated zirconia pillared clays in n-hexane transformation, *J. Appl. Sci. Res.* 5 (12), 2009, 2332-2342.
- 162.Ramos MJ, Gomez JP, Dorado F Sanchez P, Valverde J L, Hydroisomerisation of a refinery naptha stream over agglomerated Pd-zeolites, *Inds. Eng. Chem. Res.*, 44 (24), 2005, 9050-9058.
- 163.Rao GR, Rajkumar T, Interaction of Keggin anions of 12-tungstophosphoric acid with Ce<sub>x</sub>Zr<sub>1-x</sub>O<sub>2</sub> solid solutions, *J. Coll. Inter. Sci.*, 324, 2008, 134-141.
- 164.Rao GR, Rajkumar T, Investigation of 12-Tungstophosphoric Acid Supported on Ce<sub>0.5</sub>Zr<sub>0.5</sub>O<sub>2</sub> Solid Solution, *Catal. Lett.*, 120(3-4), 2008, 261-273.

165. Reddy BM, Patil MK, Organic syntheses and transformations catalyzed by sulphated zirconia. *Chem. Rev.*, 109, 2009, 2185-2208.
166. Rezgui S, Gates BC, Pentane isomerization and disproportionation catalyzed by sulfated zirconia promoted with iron and manganese, *Catal. Lett.*, 37, 1996, 5-8.
167. Ribeiro FH, Boudart M, Dalla Betta RA, Iglesia E. Catalytic reactions of n-alkanes on  $\beta$ -W<sub>2</sub>C and WC: The effect of surface oxygen on reaction pathway. *J. Catal.*, 130, 1991, 498-513.
168. Richardson JT, Twigg MV, Spencer (eds.): Principle of Catalyst Development, Plenum Press, New York 1989, 95.
169. Risch M and Wolf EE, n-Butane and n-pentane isomerization over mesoporous and conventional sulfated zirconia catalysts, *Catal. Today*, 62, 2000, 255-268.
170. Rizzuti A, Corradi A, Leonelli C, Rosa R, Pielaszek R, Lojkowski W, Microwave technique applied to the hydrothermal synthesis and sintering of calcia stabilized zirconia nanoparticles, *J. Nanopart. Res.*, 12, 2010, 327-335.
171. Rizzuti A, Leonelli C, Corradi A, Caponetti E, Martino DC, Nasillo G, Saladino ML, Structural Characterization of Zirconia Nanoparticles Prepared by Microwave-Hydrothermal Synthesis, *J. Dispersion Sci. Technol.*, 30, 2009, 1511-1516.
172. Sagadevan S, Podder J, Das I, Hydrothermal synthesis of zirconium oxide nanoparticles and its characterization, *J Mater Sci: Mater Electron*, 27, 2016, 5622-5627.
173. Said AA, Abdelwahab MM, Abdelaal M, The catalytic performance of sulphated zirconia in the dehydration of methanol to dimethyl ether, *J. Mole. Catal. A: Chem.*, 394, 2014, 40-47.
174. Sakthivel, Komura K, Sugi Y, MCM-48 supported tungstophosphoric acid: an efficient catalyst for the esterification of long-chain fatty acids and alcohols in supercritical carbon dioxide, *Inds. Eng. Chem. Res.*, 47(8), 2008, 2538-2544.
175. Sang X, Zhang L, Wang H, He D, Deng L, Huang S, Wang J, Luo Y, sulfated zirconia nanoparticles prepared by employing sulfate-containing anion surfactants via one-step route, *Powder Technology*, 253, 2014, 590-595

176. Saravanam K, Tyagi B, Bajaj HC, Catalytic activity of sulphated zirconia solid acid catalyst for esterification of myristic acid with methanol, *Ind. J. chem.* 53, 2014, 199-205.
177. Saravanan K, Tyagi B, Bajaj HC, Sulfated zirconia: an efficient solid acid catalyst for esterification of myristic acid with short chain alcohols, *Catal. Sci. Tech.*, 2, 2012, 2512-2520.
178. Sarkar D, Mohapatra D, Ray S, Bhattacharyya S, Adak S, Mitra N, Synthesis and characterization of sol-gel derived ZrO<sub>2</sub> doped Al<sub>2</sub>O<sub>3</sub> nano powder, *Ceram. Int.*, 33, 2006, 1275-1282.
179. Soultanidis N, Wong MS, Olefin impurity effect on n-pentane bimolecular isomerization over WO<sub>x</sub>/ZrO<sub>2</sub>., *Catal. Commun.*, 32, 2013, 5-10.
180. Saur O, Bensitel M, Saad M, Lavallee JC, Tripp CP, Morrow BA, The structure and stability of sulfated alumina and titania *J. Catal.*, 99(1), (1986), 104-110
181. Sawant DP, Vinu A, Lefebvre F, Halligudi SB, Tungstophosphoric acid supported over zirconia in mesoporous channels of MCM-41 as catalyst in veratrole acetylation, *J. Mole. Catal. A: Chem.*, 262, 2007, 98-108.
182. Sayari A, Dicko A, Song X, Adnot A, Characterization of Platinum on sulphated zirconia catalyst by temperature programmed reduction, *J. Catal.*, 150, 1994, 254-261.
183. Sayari A and Dicko A, The state of platinum in Pt on Sulphated Zirconia Superacid catalysts, *J. Catal.*, 145, 1994, 561-564.
184. Schanche JS, Microwave synthesis solutions from personal chemistry, *Mol. Diversity*, 7(2-4), 2003, 291-298.
185. Scheithauer M, Jentoft RE, Gates BC, Knozinger H, n- pentane isomerization catalyzed by Fe and Mn containing tungsted zirconia characterized by raman spectroscopy, *J. Catal.*, 192, 2000, 271-274.
186. Serrano DP, Uguina MA, Sanz R, Castillo E, Rodriguez A, Sanchez P, Synthesis and crystallization mechanism of zeolite TS-2 by microwave and conventional heating, *Micro. Meso. Mater.*, 69, 2004, 197-208.

187. Shalmani FM, Halladj R, Askari S, Effect of contributing factors on microwave-assisted hydrothermal synthesis of nanosized SAPO-34 molecular sieves, *Powder Technol.*, 221, 2012, 395-402.
188. Shkurenok VA, Smolikov MD, Yablokova SS, Kiryanov DI, Belyi AS, Paukshtis EA, Leonteva NN, Gulyaeva TI, Shilova AV, Drozdov VA, Pt/WO<sub>3</sub>/ZrO<sub>2</sub> catalysts for n-heptane isomerization, *Procedia Eng.*, 113, 2015, 62-67.
189. Shuning S, Xin XU, Pengfei XIE, Yinghong YUE, Weiming HUA, Zi GAO, Influence of preparative method on Al<sub>2</sub>O<sub>3</sub>-doped Pt/WO<sub>3</sub>-ZrO<sub>2</sub> catalyst for n-heptane isomerization, *Chinese J. Catal.*, 34, 2013, 898-905.
190. Singh K, Nakate UT, Microwave synthesis, characterization and photoluminescence properties of nanocrystalline zirconia, *scientific world journal*, 2, 2014, 66-70.
191. Sinhamahapatra, N. Sutradhar, M. Ghosh, H.C. Bajaj, A.B. Panda, Mesoporous sulphated zirconia mediated acetalization reactions, *Appl. Catal.A: Gen.* 402, 2011, 87-93.
192. Sohn JR, Kim HW, Catalytic and Surface properties of ZrO<sub>2</sub> modified with sulphur compound, *J. Mole. Catal.*, 52, 1989, 361-374.
193. Song H, Wang N, Song H, Li F, Effect of Pd content on the isomerization performance over Pd-S<sub>2</sub>O<sub>8</sub><sup>2-</sup>/ZrO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> catalyst, *Res. Chem. Inter.*, 42(2), 2016, 951-962.
194. Song H, Wang Na, Song HL, Feng Li, La-Ni modified S<sub>2</sub>O<sub>8</sub><sup>2-</sup>/ZrO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> catalyst in n-pentane hydro isomerization, *Catalysis Communications*, 59, 2015, 61-64.
195. Song SX, Pilko M, Kydd RA, Effect of preparative conditions of Fe and Mn sulphated zirconia catalysts on their activities for  $\eta$ -butane isomerization, *Catal. Letters*, 55, 1998, 97-100.
196. Song XM and Sayari A, Sulphated zirconia based strong solid acid catalysts, *Catal. Rev. Sci. Eng.*, 38(3), 1996, 329-412.
197. Soualah A, Lemberton JL, Pinard L, Chater L, Magnoux L, Moljord, Hydroisomerization of long chain n-alkane on bi-functional Pt/zeolite catalyst, Effect of zeolite structure on the product selectivity and on the reaction mechanism, *Appl. Catal. A: Gen.*, 336(1-2), 2008, 23-28.

198. Soultanidis N, Michael S, Wong, Olefin impurity effect on n-pentane bimolecular isomerization over WO<sub>x</sub>/ZrO<sub>2</sub>, *Catal. Comm.*, 32, 2013, 5-10.
199. Stiles B, Koch TA, Catalyst Manufacture, 2nd. ed., M. Dekker, New York 1995.
200. Stojkovic N, Vasic M, Marinkovic M, Randjelovic M, Purenovic M, Putanov P, Zarubica A, A comparative study of n -hexane isomerization over solid acids catalysts: sulfated and phosphated zirconia; *Chem. Indus. Chemi. Eng. Quar.*, 18 (2), 2012, 209-220.
201. Summers JC, Baron K, The effects of SO<sub>2</sub> on the performance of noble metal catalysts in automobile exhaust, *J. Catal.*, 57(3), 1979, 380-389.
202. Talebia G, Sohrabi M, Keiskib R, Huuhtanen M, Seid JR, Maghsoudi S, Imamverdizadeh H, Synthesis and determination of the properties of the bifunctional beta zeolite catalysts for n-heptane hydroisomerization, *J. Chil. Chem. Soc.*, 53 (1), 2008, 1424-1430.
203. Tanabe K, Misono M, Ono Y, *Study in surface science and catalysis*, 51, 1989, 1909.
204. Tanabe K, Holderich WF, Industrial application of solid acid base catalysts, *Appl. Catal A: Gen.*, 181, 1999, 399-434.
205. Tabora JE and Davis RJ, Structure of Fe, mn promoted sulphated zirconia catalyst by X-ray and IR- absorption spectroscopies, *J. Chem. Soc. Faraday Trans.*, 91, 1995, 1835-1833.
206. The Beautiful Colors of Tungsten Oxide, Tungsten Newsletter-June 2013.
207. Thomas JM, Bell RG, Catlow CRA, Ertl G, Knozinger H, Weitkamp J (eds.): Handbook of Heterogeneous Catalysis, Vol. 1, Wiley- VCH, Weinheim 1997, p. 286.
208. Tichit D, EL Alami D, Figueras F, Preparation and anion exchange properties of zirconia, *Appl. Catal. A: Gen.*, 145, 1996, 195-210.
209. Tran MT, Gnepp NS, Szabo G, Guisnet M, Influence of the calcination temperature on the acidic and catalytic properties of sulphated zirconia, *Appl. Catal. A: Gen.* 171, 1998, 207-217.
210. Travers C, Essayemb N, Delaga M, Quelen S, heteropoly anion based catalyst for paraffins Isomerization, *Catal. Today*, 65(2-4), 2001, 355-361.

211. Trimm DL, Ertl G, Kneozinger H, Weitkamp J, Wiley-VCH, Weinheim. (eds.): *Handbook of heterogeneous catalysis*, 3, 1997, 1263.
212. Trolliet C, Coudurier D, Vedrine JC, Influence of the nature and porosity of different supports on the acidic and catalytic properties of  $H_3PW_{12}O_{40}Top$ . *Catal.*, 15(1), 2001, 73-81.
213. Tsuji M, Hashimoto M, Nishizawa Y, Kubokawa M, Tsuji T, Microwave-Assisted Synthesis of Metallic Nanostructures in Solutio, *Chem. Eur. J.*, 11(2), 2005, 440-452.
214. Urzhuntsev GA, Ovchinnikova EV, Chumachenko VA, Yashnik SA, Zaikovsky GV, Echevsky, Isomerization of n-butane over Pd-SO<sub>4</sub>/ZrO<sub>2</sub> catalyst: *Prospects for commercial application*, 238, 2014, 148-156.
215. Utchariyajit K, Wongkasemjit S, Effect of synthesis parameters on mesoporous SAPO-5 with AFI-type formation via microwave radiation using alumatrane and silatrane precursors, *Micro. Meso. Mater.*, 135, 2010, 116-123.
216. Varala R, Sripad VN, Kulakarni R, Khan M, Alwarthan A, Adil SF, Sulfated tin oxide (STO) – Structural properties and application in catalysis, *A review*, 9(4), 2016, 550-573.
217. Vartuli JC, Santiesteban JG, Traverso P, Cardona-Martinez N, Chang CD, Stevenson SA, Characterization of the acid properties of tungsten/zirconia catalysts using adsorption microcalorimetry and n-pentane isomerization activity, *J. Catal.*, 187, 1999, 131-138.
218. Vazquez ALO, Reyes MPR, Dominguez CJL, The effect of sulfates concentration in sulfated zirconia (SZ) catalysts on n-heptane isomerization, *Pet. Sci. Tech.*, 28, 2010, 374-381.
219. Vera CR, Pieck CL, Shimizu K, Parera JM, Tetragonal Structure, Anionic Vacancies and Catalytic Activity of SO<sub>4</sub><sup>2-</sup>-ZrO<sub>2</sub> Catalysts for n butane Isomerization, *Appl. Catal. A: Gen.*, 230, 2002, 137-151.
220. Vishwanathan V, Balakrishna G, Rajesh B, Jayasri V, Sikhwivhilu LM, Coville NJ, Alkylation of catechol with methanol to give guaiacol over sulphate modified zirconia solid acid catalysts: The influence of structural modification of zirconia on catalytic performance, *Catal. Commun.*, 9, 2008, 2422–2427.

221. Vladimir KI, Alexander YB, Gennady PK et al., PH control of the structure, composition and catalytic activity of sulfated zirconia, *J. of Solid State Chem.*, 198, 2013, 496–505.
222. Wang JA, Zhou XL, Chen LF, Norena LE, Yu GX, Li CL, Hydroisomerization of n-heptane on the Pt/H<sub>3</sub>PW<sub>12</sub>O<sub>40</sub>/Zr-MCM-41 catalysts, *J. Mole. Catal. A: Chem.*, 299, 2009, 68-76.
223. Wang JH, Mou CY, alumina promoted mesoporous sulphated zirconia: A catalyst for n- butane isomerization, *Appl. Catal. A: Gen.*, 286, 2005, 128-136.
224. Wang S, Zhao L, Wang W, Zhao Y, Zhang G, Ma X, Gong J, Morphology control of ceria nanocrystals for catalytic conversion of CO<sub>2</sub> with methanol, *Nanoscale*, 5, 2013, 5582-5588.
225. Wang JA, Gonzalez G, Chen L, Valenzuela MA, Moran M, Vazquez A, Castillo S, Templated synthesis and catalytic properties of a Rh/ceria-zirconia catalyst, *React. Kinet. Catal. Lett.*, 90, 2007, 381-387.
226. Wang JA, Zhou XL, Chen LF, Norena LE, Yu GX, Li CL, Hydroisomerization of n-heptane on Pt/H<sub>3</sub>PW<sub>12</sub>O<sub>40</sub>/Zr-MCM-41 Catalysts. *J. of mol. Catal. A: chem.*, 299, 2009, 68-76.
227. Wang JH, Mou CY, Alumina promote mesoporous sulphated zirconia catalyst for n-butane isomerization, *Appl. Catal., A: Gen.*, 286, 2005, 128-136.
228. Weisz PB, Polyfunctional heterogeneous catalysis. *Adv. Catal.*, 13, 1962, 137-190.
229. Weyda H. and Kohler E., Modern refining concepts—an update on naphtha-isomerization to modern gasoline manufacture. *Catal. Today*, 81, 2003, 51-55.
230. Woltz, C, Jentys A, Lercher J, A improving bi-functional zeolite catalysts for alkane hydroisomerization via gas phase sulphation, *J. Catal.*, 237, 2006, 337-348.
231. Wong ST, Li T, Lee JF, Mou CY, Cheng S, Aluminum-promoted tungstated zirconia catalyst in n-butane isomerization reaction, *J. Catal.*, 215(1), 2003, 45-56.
232. Yadav GD and Nair JJ, Sulfated zirconia and its modified versions as promising catalysts for industrial processesMicro. Meso. Mater., 33, 1999, 1-48.
233. Yamaguchi T, Jin T, Ishida T, Tanabe K, Structural identification of acid sites of Sulphur promoted metal oxide, *J. Phy. Chem.*, 90, 1986, 4794- 4796.

234. Yamaguchi T, Jin T, Tanabe K, Structure of acid sites on sulfur-promoted iron oxide, *J. Phy. Chem.* 90(14), 1986, 3148-3152.
235. Yang X, Jentoft FC, Jentoft RE, Girgsdies F, Ressler T, Sulphated zirconia with ordered mesopores as an active catalyst for n-butane isomerization, *Catal. Lett.*, 81, 2002, 25-31.
236. Yao J, Liu N, Shi, L, Wang X, Sulfated zirconia as a novel and recyclable catalyst for removal of olefins from aromatics, *Catal. Commu.*, 66, 2015, 126-129.
237. Yasakova EA, Situdikova AV, Achmetov AF, Tendency of isomerization process development in Russia and foreign countries, *Oil and gas business*, 2010.
238. Yori JC, Pieck CL, Parera JM, Alkane isomerization on MoO<sub>3</sub>/ZrO<sub>2</sub> catalysts, *Cat al. Lett.*, 64, 2000, 141-146.
239. Yori JC, Grau JM, Benitez VM, Sepulveda J, Hydro isomerization cracking of n-octane on heteropolyacid H<sub>3</sub>PW<sub>12</sub>O<sub>40</sub> supported on ZrO<sub>2</sub>, SiO<sub>2</sub> and carbon Effect of Pt incorporation on catalyst performance, *Appl. Catal. A: Gen.*, 286, 2005, 71-78.
240. Yori JC, Amato MA, Costa G, Parera JM, Isomerization of n-Butane on Pt/SO<sub>4</sub><sup>2-</sup>-ZrO<sub>2</sub> and Mechanical Mixtures of Pt/Al<sub>2</sub>O<sub>3</sub>+SO<sub>4</sub><sup>2-</sup>-ZrO<sub>2</sub> *J. Catal.*, 153, 1995, 218-223.
241. Zalewski DJ Saeed A, Doolin PK, Characterization of catalytically active sulfated zirconia, *Catal. Today*, 53, 1999, 419-432.
242. Zhang C, Miranda R, Davis BH, Platinum sulphated Zirconia. Infrared study of adsorbed pyridine, *Catal. Letters*, 29, 1994, 349-359.
243. Zhang R, Meng X, Liu Z, Meng J, Xu C, Isomerization of n-pentane catalyzed by acidic chloro aluminate ionic liquids, *Ind. and Engg. Chem. Res.*, 47, 2008, 8205-8210.
244. Zheng JY, Pang JB, Qiu KY, Wei Y, Synthesis of mesoporous titanium dioxide materials by using a mixture of organic compounds as a non-surfactant template, *J. Mater. Chem.*, 11, 2001, 3367-3372.
245. Zimmermann Y, Spange S, Probing surface acidity, basicity, and dipolarity/polarizability of 12-tungstophosphoric acid by means of solvatochromic dyes, *New J. Chem.*, 26, 2002, 1179-1184.