

REFERENCES

- Abbas-Abadi M. S., Haghghi M. N., and Yeganeh H., "Evaluation of pyrolysis product of virgin high density polyethylene degradation using different process parameters in a stirred reactor," *Fuel Processing Technology*, 2013, v. 109, pp. 90-95.
- Abbas-Abadi M. S., Haghghi M. N., Yeganeh H., and McDonald A. G., "Evaluation of pyrolysis process parameters on polypropylene degradation products," *Journal of Analytical and Applied Pyrolysis*, 2014, v. 109, pp. 272-277.
- Achilias D.S., Roupakias C., Megalokonomos P., Lappas A., and Antonakou E., "Chemical recycling of plastic wastes made from polyethylene (LDPE and HDPE) and polypropylene (PP)," *Journal of Hazardous Materials*, 2007, v. 149, pp. 536-542.
- Adrados A., Marco I. de, Caballero B. M., López A., Laresgoiti M. F., and Torres A., "Pyrolysis of plastic packaging waste: A comparison of plastic residuals from material recovery facilities with simulated plastic waste," *Waste Management*, 2012, v. 32, pp. 826-832.
- Agarwal S., and Rani A., "Adsorption of resorcinol from aqueous solution onto CTAB/NaOH/flyash composites: Equilibrium, kinetics and thermodynamics," *Journal of Environmental Chemical Engineering*, 2017, v. 5, pp. 526-538.
- Aguado J., Serrano D. P., Escola J. M., Garagorri E., and Fernández J. A., "Catalytic conversion of polyolefins into fuels over zeolite beta," *Polymer Degradation and Stability*, 2000, v. 69, pp. 11-16.
- Aguado J., Serrano D. P., San Miguel G., Castro M. C., and Madrid S., "Feedstock recycling of polyethylene in a two-step thermo-catalytic reaction system," *Journal of Analytical and Applied Pyrolysis*, 2007, v. 79, pp. 415-423.
- Aguado J., Serrano D., and Escola J., "Fuels from waste plastics by thermal and catalytic processes: a review," *Industrial & Engineering Chemistry Research*, 2008, v. 47, pp. 7982-7992.

Aguado J., Serrano D., Escola J., and Garagorri E., "Catalytic conversion of low-density polyethylene using a continuous screw kiln reactor," *Catalysis Today*, 2002, v. 75, pp. 257-262.

Aguado J., Sotelo J. L., Serrano D. P., Calles J. A., and Escola J. M., "Catalytic Conversion of Polyolefins into Liquid Fuels over MCM-41: Comparison with ZSM-5 and Amorphous SiO₂-Al₂O₃," *Energy & Fuels*, 1997, v. 11, pp. 1225-1231.

Aguado J., Sotelo J., Serrano D., Calles J., and Escola J., "Catalytic Conversion of Polyolefins into Liquid Fuels over MCM-41: Comparison with ZSM-5 and Amorphous SiO₂- Al₂O₃," *Energy & fuels*, 1997, v. 11, pp. 1225-1231.

Aguado R., Olazar M., Gaisán B., Prieto R., and Bilbao J., "Kinetic Study of Polyolefin Pyrolysis in a Conical Spouted Bed Reactor," *Industrial & Engineering Chemistry Research*, 2002, v. 41, pp. 4559-4566.

Ahmad I., Khan M. I., Khan H., Ishaq M., Tariq R., Gul K., "Pyrolysis study of polypropylene and polyethylene into premium oil products," *International journal of green energy*, 2015, v. 12, pp. 663-671.

Alyani M., Towfighi J., and Sadrameli S. M., "Effect of process variables on product yield distribution in thermal catalytic cracking of naphtha to light olefins over Fe/HZSM-5," *Korean Journal of Chemical Engineering*, 2011, v. 28, p. 1351.

Anders G., Burkhardt I., Illgen U., Schulz I., and Scheve J., "The influence of HZSM-5 zeolite on the product composition after cracking of high boiling hydrocarbon fractions," *Applied Catalysis*, 1990, v. 62, pp. 271-280.

Anndrews G., "Emerging technologies in plastics recycling," *ACS Symposium Ser. 513*, Washington, 1992.

Anunziata O. A., and Pierella L. B., "Conversion of polyethylene into aromatic hydrocarbons using MEL and BEA zeolites," *Studies in surface science and catalysis*, 1999, v. 125, pp. 481-488.

Artetxe M., Lopez G., Amutio M., Elordi G., Bilbao J., and Olazar M., "Cracking of High Density Polyethylene Pyrolysis Waxes on HZSM-5 Catalysts of Different Acidity," *Industrial & Engineering Chemistry Research*, 2013, v. 52, pp. 10637-10645.

Arthur G., Yeuh-Hui L., Paul S., and John D., "Catalytic polymer degradation for producing hydrocarbons over zeolites," *Studies in Surface Science and Catalysis*, 1999, v. 121, pp. 197-202.

Audisio G., Silvani A., Beltrame P., and Carniti P., "Catalytic thermal degradation of polymers: Degradation of polypropylene," *Journal of analytical and applied pyrolysis*, 1984, v. 7, pp. 83-90.

Bagri R., and Williams P. T., "Catalytic pyrolysis of polyethylene," *Journal of Analytical and Applied Pyrolysis*, 2002, v. 63, pp. 29-41.

Bagri R., and Williams P. T., "Fluidised-bed catalytic pyrolysis of polystyrene," *Journal of the Institute of Energy*, 2002, v. 75, pp. 117-123.

Balakrishnan R. K., and Guria C., "Thermal degradation of polystyrene in the presence of hydrogen by catalyst in solution," *Polymer Degradation and Stability*, 2007, v. 92, pp. 1583-1591.

Ballice L., "A kinetic approach to the temperature-programmed pyrolysis of low- and high-density polyethylene in a fixed bed reactor: determination of kinetic parameters for the evolution of n-paraffins and 1-olefins," *Fuel*, 2001, v. 80, pp. 1923-1935.

Bayat O., "Characterisation of Turkish fly ashes," *Fuel*, 1998, v. 77, pp. 1059-1066.

Beyene H. D., "Recycling of Plastic Waste into Fuels, a Review," *International Journal of Science, Technology and Society*, 2014, v. 2, pp. 190-195.

Blazso M., "Composition of liquid fuels derived from the pyrolysis of plastics," *Feedstock recycling and pyrolysis of waste plastics: converting waste plastics into diesel and other fuels*, 2006, pp. 315-344.

Bockhorn H., Hornung A., Hornung U., and Schawaller D., "Kinetic study on the thermal degradation of polypropylene and polyethylene," *Journal of Analytical and Applied Pyrolysis*, 1999, v. 48, pp. 93-109.

Buekens A.G., and Huang H., "Catalytic plastics cracking for recovery of gasoline-range hydrocarbons from municipal plastic wastes," *Resources, Conservation and Recycling*, 1998, v. 23, pp. 163-181.

Buekens A.G., and Yang J., "Recycling of WEEE plastics: a review," *Journal of Material Cycles and Waste Management*, 2014, v. 16, pp. 415-434.

C.P.C.B., "Annual report of Plastic Waste Management Rules," 2018, Available: <https://cpcb.nic.in/uploads/plasticwaste/>

Cardona S. C., and Corma A., "Tertiary recycling of polypropylene by catalytic cracking in a semibatch stirred reactor: Use of spent equilibrium FCC commercial catalyst," *Applied Catalysis B: Environmental*, 2000, v. 25, pp. 151-162.

Castano P., Elordi G., Olazar M., Aguayo A. T., Pawelec B., and Bilbao J., "Insights into the coke deposited on HZSM-5, H and HY zeolites during the cracking of polyethylene," *Applied Catalysis B: Environmental*, 2011, v. 104, pp. 91-100.

Castello D., He S., Ruiz M.P., Westerhof R.J.M., Heeres H.J., Seshan K., "Is it possible to increase the oil yield of catalytic pyrolysis of biomass? A study using commercially-available acid and basic catalysts in ex-situ and in-situ modus," *Journal of Analytical and Applied Pyrolysis*, 2018.

Cejka J., and Bekkum H.V., "Zeolites and Ordered Mesoporous Materials: Progress and Prospects. Elsevier," *The 1st FEZA School on Zeolites, Prague, Czech Republic*, 2005.

Cepeliogullar O., and Putun A. E., "Utilization of two different types of plastic wastes from daily and industrial life," *Journal of Selcuk University Natural and Applied Science*, 2013, v. 2, pp. 694-706.

Cepeliogullar O., and Putun A. E., "Utilization of two different types of plastic wastes from daily and industrial life," *ICOEST Cappadocia*, 2013, pp. 1-13.

Cha W. S., Kim S. B., and McCoy B. J., "Study of polystyrene degradation using continuous distribution kinetics in a bubbling reactor," *Korean Journal of Chemical Engineering*, 2002, v. 19, pp. 239-245.

Chan J.H., and Balke S., "The thermal degradation kinetics of polypropylene: Part III. Thermogravimetric analyses," *Polymer degradation and stability*, 1997, v. 57, pp. 135-149.

Cho M. H., Jung S. H., and Kim J. S., "Pyrolysis of mixed plastic wastes for the recovery of benzene, toluene, and xylene (BTX) aromatics in a fluidized bed and chlorine removal by applying various additives," *Energy & Fuels*, 2009, v. 24, pp. 1389-1395.

Choi G.G., Oh S.J., and Kim J.S., "Clean pyrolysis oil from a continuous two-stage pyrolysis of scrap tires using in-situ and ex-situ desulfurization," *Energy*, 2017, v. 141, pp. 2234-2241.

Choi S. J., Park Y. K., Jeong K. E., Kim T. W., Chae H. J., and Park S. H., "Catalytic degradation of polyethylene over SBA-16," *Korean Journal of Chemical Engineering*, 2010, v. 27, pp. 1446-1451.

Ciliz K., Ekinçi E., and Snape C. E., "Pyrolysis of virgin and waste polypropylene and its mixtures with waste polyethylene and polystyrene," *Waste management*, 2004, v. 24, pp. 173-181.

Corma A., Planelles J., Sanchez-Marin J., and Tomas F., "The role of different types of acid site in the cracking of alkanes on zeolite catalysts," *Journal of Catalysis*, 1985, v. 93, pp. 30-37.

Cullis F., and Hirschler M., "The combustion of organic polymers," Oxford University Press, USA, 1981, v. 5.

Das P., and Tiwari P., "Valorization of packaging plastic waste by slow pyrolysis," *Resources, Conservation and Recycling*, 2018, v. 128, pp. 69-77.

De la Puente G., Klocker C., and Sedran U., "Conversion of waste plastics into fuels: Recycling polyethylene in FCC," *Applied Catalysis B: Environmental*, 2002, v. 36, pp. 279-285.

De Lasa I., "Riser simulator," ed: *Google Patents*, 1992.

Degnan T. F., "Applications of zeolites in petroleum refining," *Topics in Catalysis*, 2000, v. 13, pp. 349-356.

Demirbas A., "Pyrolysis of municipal plastic wastes for recovery of gasoline-range hydrocarbons," *Journal of Analytical and Applied Pyrolysis*, 2004, v. 72, pp. 97-102.

Desai S. B., and Galage C., "Production and analysis of pyrolysis oil from waste plastic in Kolhapur city," *International Journal of Engineering Research and General Science*, 2015, v. 3, pp. 590-595.

Ding W., Liang J., and Anderson L. L., "Thermal and catalytic degradation of high density polyethylene and commingled post-consumer plastic waste," *Fuel Processing Technology*, 1997, v. 51, pp. 47-62.

Djebara M., Stoquert J., Abdesselam M., Muller D., and Chami A., "FTIR analysis of polyethylene terephthalate irradiated by MeV He⁺," *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 2012, v. 274, pp. 70-77.

Dolezal Z., Pacakova V., and Kovarova J., "The effects of controlled aging and blending of low-and high-density polyethylenes, polypropylene and polystyrene on their thermal degradation studied by pyrolysis gas chromatography," *Journal of Analytical and Applied Pyrolysis*, 2001, v. 57, pp. 177-185.

Duan D., Wang Y., Dai L., Ruan R., Zhao Y., Fan L., "Ex-situ catalytic co-pyrolysis of lignin and polypropylene to upgrade bio-oil quality by microwave heating," *Bioresource Technology*, 2017, v. 241, pp. 207-213.

Elordi G., Olazar M., Castaño P., Artetxe M., and Bilbao J., "Polyethylene Cracking on a Spent FCC Catalyst in a Conical Spouted Bed," *Industrial & Engineering Chemistry Research*, 2012, v. 51, pp. 14008-14017.

Elordi G., Olazar M., Lopez G., Amutio M., Artetxe M., Aguado R., "Catalytic pyrolysis of HDPE in continuous mode over zeolite catalysts in a conical spouted bed reactor," *Journal of Analytical and Applied Pyrolysis*, 2009, v. 85, pp. 345-351.

FakhrHoseini S. M., and Dastanian M., "Predicting pyrolysis products of PE, PP, and PET using NRTL activity coefficient model," *Journal of Chemistry*, 2013, v. 2013, pp. 1-5.

Faravelli T., Pinciroli M., Pisano F., Bozzano G., Dente M., and Ranzi E., "Thermal degradation of polystyrene," *Journal of analytical and applied pyrolysis*, 2001, v. 60, pp. 103-121.

Fekhar B., Gombor L., and Miskolczi N., "Pyrolysis of chlorine contaminated municipal plastic waste: In-situ upgrading of pyrolysis oils by Ni/ZSM-5, Ni/SAPO-11, red mud and Ca(OH)₂ containing catalysts," *Journal of the Energy Institute*, 2018.

Fernández A.M., Barriocanal C., and Alvarez R., "Pyrolysis of a waste from the grinding of scrap tyres," *Journal of hazardous materials*, 2012, v. 203, pp. 236-243.

Filip M. R., Pop A., Perhaita I., Moldovan M., and Trusca R., "Investigation of thermal and catalytic degradation of polystyrene waste into styrene monomer over natural volcanic tuff and Florisil catalysts," *Central European Journal of Chemistry*, 2013, v. 11, pp. 725-735.

Forum W. E., "The New Plastics Economy: Rethinking the future of plastics", 2016, Available: <https://www.weforum.org/reports/the-new-plastics-economy-rethinking-the-future-of-plastics>

Gao F., "Pyrolysis of Waste Plastics into Fuels," Ph.D. Thesis, Chemical Engineering, University of Canterbury, New Zealand, 2010.

Gao R., and Xu Z., "Pyrolysis and utilization of nonmetal materials in waste printed circuit boards: Debromination pyrolysis, temperature-controlled condensation, and synthesis of oil-based resin," *Journal of Hazardous Materials*, 2019, v. 364, pp. 1-10.

Garcia R. A., Serrano D. P., and Otero D., "Catalytic cracking of HDPE over hybrid zeolitic–mesoporous materials," *Journal of Analytical and Applied Pyrolysis*, 2005, v. 74, pp. 379-386.

Gaurh P., and Pramanik H., "A novel approach of solid waste management via aromatization using multiphase catalytic pyrolysis of waste polyethylene," *Waste Management*, 2018a, v. 71, pp. 86-96.

Gaurh P., and Pramanik H., "Production and characterization of pyrolysis oil using waste polyethylene in a semi batch reactor," *Indian Journal of Chemical Technology*, 2018c, v. 25, pp. 336-344.

Gaurh P., and Pramanik H., "Production of benzene/toluene/ethyl benzene/xylene (BTEX) via multiphase catalytic pyrolysis of hazardous waste polyethylene using low cost fly ash synthesized natural catalyst," *Waste Management*, 2018b, v. 77, pp. 114-130.

Georgia, "Breaking Down Plastics: New Standard Specification May Facilitate Use of Additives That Trigger Biodegradation of Oil - Based Plas Georgia Tech Research Institute," Georgia Tech Research Institution, 03 Dec 2013.

GOI, "Forests and Climate Change Notification," The Government of India, Ministry of Environment, New Delhi, 2016.

Gougazeh M., and Buhl J. C., "Synthesis and characterization of zeolite A by hydrothermal transformation of natural Jordanian kaolin," *Journal of the Association of Arab Universities for Basic and Applied Sciences*, 2014, v. 15, pp. 35-42.

Habib Jr E.T., Zhao X., Yaluris G., Cheng W., Boock L., and Gilson J.P., "Advances in fluid catalytic cracking," *Zeolites for Cleaner Technologies*, 2002, pp. 105-130.

- Hall M. L., and Livingston W. R., "Fly ash quality, past, present and future, and the effect of ash on the development of novel products," *Journal of Chemical Technology & Biotechnology*, 2002, v. 77, pp. 234-239.
- Hamidzadeh M., Komeili S., and Saeidi M., "Seed-induced synthesis of ZSM-5 aggregates using the Silicate-1 as a seed: Characterization and effect of the Silicate-1 composition," *Microporous and Mesoporous Materials*, 2018, v. 268, pp. 153-161.
- Harding K., Dennis J., Von Blottnitz H., and Harrison S., "Environmental analysis of plastic production processes: comparing petroleum-based polypropylene and polyethylene with biologically-based poly- β -hydroxybutyric acid using life cycle analysis," *Journal of biotechnology*, 2007, v. 130, pp. 57-66.
- Hayashi J. I., Nakahara T., Kusakabe K., and Morooka S., "Pyrolysis of polypropylene in the presence of oxygen," *Fuel Processing Technology*, 1998, v. 55, pp. 265-275.
- Hernández M. D. R., García Á. N., and Marcilla A., "Study of the gases obtained in thermal and catalytic flash pyrolysis of HDPE in a fluidized bed reactor," *Journal of analytical and applied pyrolysis*, 2005, v. 73, pp. 314-322.
- Hernandez M. D. R., Gómez A., García Á. N., Agulló J., and Marcilla A., "Effect of the temperature in the nature and extension of the primary and secondary reactions in the thermal and HZSM-5 catalytic pyrolysis of HDPE," *Applied Catalysis A: General*, 2007, v. 317, pp. 183-194.
- Heydariaraghi M., Ghorbanian S., Hallajisani A., and Salehpour A., "Fuel properties of the oils produced from the pyrolysis of commonly-used polymers: Effect of fractionating column," *Journal of Analytical and Applied Pyrolysis*, 2016, v. 121, pp. 307-317.
- Hopewell J., Dvorak R., and Kosior E., "Plastics recycling: challenges and opportunities," *Philosophical Transactions of the Royal Society B: Biological Sciences*, 2009.
- Hower J. C., Robertson J. D., Thomas G. A., Wong A. S., Schram W. H., and Graham U. M., "Characterization of fly ash from Kentucky power plants," *Fuel*, 1996, v. 75, pp. 403-411.

Hwang E.Y., Choi J.K., Kim D.H., Park D.W., and Woo H.C., "Catalytic degradation of polypropylene I. Screening of catalysts," *Korean Journal of Chemical Engineering*, 1998, v. 15, pp. 434-438.

Hwang E.Y., Kim J.R., Choi J.K., Woo H.C., and Park D.W., "Performance of acid treated natural zeolites in catalytic degradation of polypropylene," *Journal of Analytical and Applied Pyrolysis*, 2002, v. 62, pp. 351-364.

Jakab E., Varhegyi G., and Faix O., "Thermal decomposition of polypropylene in the presence of wood-derived materials," *Journal of Analytical and Applied Pyrolysis*, 2000, v. 56, pp. 273-285.

Jan M. R., Shah J., and Gulab H., "Catalytic degradation of waste high-density polyethylene into fuel products using BaCO₃ as a catalyst," *Fuel Processing Technology*, 2010, v. 91, pp. 1428-1437.

Jin W., Shen D., Q. Liu, and Xiao R., "Evaluation of the co-pyrolysis of lignin with plastic polymers by TG-FTIR and Py-GC/MS," *Polymer Degradation and Stability*, 2016, v. 133, pp. 65-74.

Joo H. S., and Guin J. A., "Continuous upgrading of a plastics pyrolysis liquid to an environmentally favorable gasoline range product," *Fuel Processing Technology*, 1998, v. 57, pp. 25-40.

Jung H., Matsuto T., and Tanaka N., "Behavior of metals in ash melting and gasification-melting of municipal solid waste (MSW)," *Waste Management*, 2005, v. 25, pp. 301-310.

Kaminsky W., "Recycling of polymeric materials by pyrolysis," *Makromolekulare Chemie. Macromolecular Symposia*, 1991, pp. 381-393.

Kaminsky W., "Thermal recycling of polymers," *Journal of Analytical and Applied Pyrolysis*, 1985, v. 8, pp. 439-448.

Kaminsky W., Predel M., and Sadiki A., "Feedstock recycling of polymers by pyrolysis in a fluidised bed," *Polymer Degradation and Stability*, 2004, v. 85, pp. 1045-1050.

Karagöz S., Yanik J., Uçar S., Sağlam M., and Song C., "Catalytic and thermal degradation of high-density polyethylene in vacuum gas oil over non-acidic and acidic catalysts," *Applied Catalysis A: General*, 2003, v. 242, pp. 51-62.

Kiang J. K. Y., Uden P., and Chien J., "Polymer reactions—Part VII: thermal pyrolysis of polypropylene," *Polymer Degradation and Stability*, 1980, v. 2, pp. 113-127.

Kim J. R., Yoon J. H., and Park D. W., "Catalytic recycling of the mixture of polypropylene and polystyrene," *Polymer degradation and stability*, 2002, v. 76, pp. 61-67.

Kim S.S. and Kim S., "Pyrolysis characteristics of polystyrene and polypropylene in a stirred batch reactor," *Chemical Engineering Journal*, 2004, v. 98, pp. 53-60.

Koukouzas N. K., Zeng R., Perdikatsis V., Xu W., and Kakaras E. K., "Mineralogy and geochemistry of Greek and Chinese coal fly ash," *Fuel*, 2006, v. 85, pp. 2301-2309.

Kukier U., Ishak C. F., Sumner M.E., and Miller W. P., "Composition and element solubility of magnetic and non-magnetic fly ash fractions," *Environmental Pollution*, 2003, v. 123, pp. 255-266.

Kumar S., Prakash R., Murugan S., and Singh R., "Performance and emission analysis of blends of waste plastic oil obtained by catalytic pyrolysis of waste HDPE with diesel in a CI engine," *Energy conversion and management*, 2013, v. 74, pp. 323-331.

Kung K. H. S., and Hayes K. F., "Fourier transform infrared spectroscopic study of the adsorption of cetyltrimethylammonium bromide and cetylpyridinium chloride on silica," *Langmuir*, 1993, v. 9, pp. 263-267.

Kyaw K.T., and Hmwe C. S. S., "Effect of various catalysts on fuel oil pyrolysis process of mixed plastic wastes," *International Journal of Advances in Engineering & Technology*, 2015, v. 8, p. 794.

Lattimer R. P., "Direct analysis of polypropylene compounds by thermal desorption and pyrolysis—mass spectrometry," *Journal of Analytical and Applied Pyrolysis*, 1993, v. 26, pp. 65-92.

Lee K. H., "Composition of aromatic products in the catalytic degradation of the mixture of waste polystyrene and high-density polyethylene using spent FCC catalyst," *Polymer Degradation and Stability*, 2008, v. 93, pp. 1284-1289.

Lee K. H., "Effects of the types of zeolites on catalytic upgrading of pyrolysis wax oil," *Journal of analytical and applied pyrolysis*, 2012, v. 94, pp. 209-214.

Lee K. H., "Thermal and catalytic degradation of pyrolytic oil from pyrolysis of municipal plastic wastes," *Journal of Analytical and Applied Pyrolysis*, 2009, v. 85, pp. 372-379.

Lee K. H., and Shin D. H., "Characteristics of liquid product from the pyrolysis of waste plastic mixture at low and high temperatures: Influence of lapse time of reaction," *Waste Management*, 2007, v. 27, pp. 168-176.

Lee K. H., Noh N. S., Shin D. H., and Seo Y., "Comparison of plastic types for catalytic degradation of waste plastics into liquid product with spent FCC catalyst," *Polymer Degradation and Stability*, 2002, v. 78, pp. 539-544.

Lee S., Yoon J., Kim J., and Park D., "Catalytic degradation of polystyrene over natural clinoptilolite zeolite," *Polymer degradation and stability*, 2001, v. 74, pp. 297-305.

Li A.M., Li X., Li S., Ren Y., Chi Y., Yan J., "Pyrolysis of solid waste in a rotary kiln: influence of final pyrolysis temperature on the pyrolysis products," *Journal of analytical and applied pyrolysis*, 1999, v. 50, pp. 149-162.

Li X., Zhang H., Li J., Su L., Zuo J., S. Komarneni, et al., "Improving the aromatic production in catalytic fast pyrolysis of cellulose by co-feeding low-density polyethylene," *Applied Catalysis A: General*, 2013, v. 455, pp. 114-121.

Lin Y. H., and Yang M. H., "Catalytic conversion of commingled polymer waste into chemicals and fuels over spent FCC commercial catalyst in a fluidised-bed reactor," *Applied Catalysis B: Environmental*, 2007, v. 69, pp. 145-153.

Liu Y., Qian J., and Wang J., "Pyrolysis of polystyrene waste in a fluidized-bed reactor to obtain styrene monomer and gasoline fraction," *Fuel Processing Technology*, 2000., v. 63, pp. 45-55

Lopez A., De Marco I., Caballero B., Laresgoiti M., Adrados A., and Aranzabal A., "Catalytic pyrolysis of plastic wastes with two different types of catalysts: ZSM-5 zeolite and Red Mud," *Applied Catalysis B: Environmental*, 2011a, v. 104, pp. 211-219.

Lopez-Uribebarrenechea A., de Marco I., Caballero B. M., Laresgoiti M. F., and Adrados A., "Catalytic stepwise pyrolysis of packaging plastic waste," *Journal of Analytical and Applied Pyrolysis*, 2012, v. 96, pp. 54-62.

Luo G., and Resende F. L. P., "In-situ and ex-situ upgrading of pyrolysis vapors from beetle-killed trees," *Fuel*, 2016, v. 166, pp. 367-375.

Luo G., Suto T., Yasu S., and Kato K., "Catalytic degradation of high-density polyethylene and polypropylene into liquid fuel in a powder-particle fluidized bed," *Polymer Degradation and Stability*, 2000, v. 70, pp. 97-102.

Ma C., Sun L., Jin L., Zhou C., Xiang J., Hu S., "Effect of polypropylene on the pyrolysis of flame retarded high impact polystyrene," *Fuel Processing Technology*, 2015, v. 135, pp. 150-156.

Mahgoub K. A., and Al-Khattaf S., "Catalytic cracking of hydrocarbons in a riser simulator: The effect of catalyst accessibility and acidity," *Energy & fuels*, 2005, v. 19, pp. 329-338.

Malik M., Soni N. K., Kanagasabapathy K. V., Prasad M. V. R., and Satpathy K. K., "Characterisation of fly ash from coal-fired thermal power plants using energy dispersive X-ray fluorescence spectrometry," *Sci. Rev. Chem. Commun.*, 2016, v. 6, pp. 91-101.

Malkow T., "Novel and innovative pyrolysis and gasification technologies for energy efficient and environmentally sound MSW disposal," *Waste management*, 2004, v. 24, pp. 53-79.

Manickaraja E., and Tamilkolundu S., "Catalytic degradation of waste PVC into liquid fuel using BaCO₃ as catalyst and its blending properties with diesel fuel," *Discover*, 2014, v. 23, pp. 74-8.

Manos G., Garforth A., and Dwyer J., "Catalytic degradation of high-density polyethylene over different zeolitic structures," *Industrial & engineering chemistry research*, 2000, v. 39, pp. 1198-1202.

Manos G., Yusof I. Y., Papayannakos N., and Gangas N. H., "Catalytic cracking of polyethylene over clay catalysts. Comparison with an ultrastable Y zeolite," *Industrial & engineering chemistry research*, 2001, v. 40, pp. 2220-2225.

Marcilla A., Beltrán M. I., and Navarro R., "Thermal and catalytic pyrolysis of polyethylene over HZSM5 and HUSY zeolites in a batch reactor under dynamic conditions," *Applied Catalysis B: Environmental*, 2009, v. 86, pp. 78-86.

Marcilla A., Beltran M., and Conesa J., "Catalyst addition in polyethylene pyrolysis: Thermogravimetric study," *Journal of Analytical and Applied Pyrolysis*, 2001, v. 58, pp. 117-126.

Marcilla A., Gómez A., Reyes-Labarta J. A., and Giner A., "Catalytic pyrolysis of polypropylene using MCM-41: kinetic model," *Polymer Degradation and Stability*, 2003, v. 80, pp. 233-240.

Marcilla A., Gómez-Siurana A., and Berenguer D., "Study of the influence of the characteristics of different acid solids in the catalytic pyrolysis of different polymers," *Applied Catalysis A: General*, 2006, v. 301, pp. 222-231.

Mastellone L., Perugini F., Ponte M., and Arena U., "Fluidized bed pyrolysis of a recycled polyethylene," *Polymer Degradation and Stability*, 2002, v. 76, pp. 479-487.

Mastral J., Berrueco C., Gea M., and Ceamanos J., "Catalytic degradation of high density polyethylene over nanocrystalline HZSM-5 zeolite," *Polymer degradation and stability*, 2006, v. 91, pp. 3330-3338.

McCaffrey W.C., Kamal M. R., and Cooper D.G., "Thermolysis of polyethylene," *Polymer Degradation and Stability*, 1995, v. 47, pp. 133-139.

Mertinkat J., Kirsten A., Predel M., and Kaminsky W., "Cracking catalysts used as fluidized bed material in the Hamburg pyrolysis process," *Journal of Analytical and Applied pyrolysis*, 1999, v. 49, pp. 87-95.

Miandad R., Barakat M. A., Rehan M., Aburiazaiza A. S., Ismail I. M. I., and Nizami A. S., "Plastic waste to liquid oil through catalytic pyrolysis using natural and synthetic zeolite catalysts," *Waste Management*, 2017, v. 69, pp. 66-78.

Miandad R., Barakat M., Aburiazaiza A. S., Rehan M., and Nizami A., "Catalytic pyrolysis of plastic waste: a review," *Process Safety and Environmental Protection*, 2016, v. 102, pp. 822-838.

Michael P., "Plastic waste total in MSW," *Society of the Plastic Industry*, 2010.

Miranda R., Yang J., Roy C., and Vasile C., "Vacuum pyrolysis of PVC I. Kinetic study," *Polymer degradation and stability*, 1999, v. 64, pp. 127-144.

Mishra S. R., Kumar S., Wagh A., Rho J. Y., and Gheyi T., "Temperature-dependent surface topography analysis of Illinois class F fly ash using ESEM and AFM," *Materials Letters*, 2003, v. 57, pp. 2417-2424.

Miskolczi N., Angyal A., Bartha L., and Valkai I., "Fuels by pyrolysis of waste plastics from agricultural and packaging sectors in a pilot scale reactor," *Fuel Processing Technology*, 2009, v. 90, pp. 1032-1040.

Miskolczi N., Bartha L., and Deák G., "Thermal degradation of polyethylene and polystyrene from the packaging industry over different catalysts into fuel-like feed stocks," *Polymer degradation and stability*, 2006, v. 91, pp. 517-526.

Miskolczi N., Bartha L., Deak G., and Jover B., "Thermal degradation of municipal plastic waste for production of fuel-like hydrocarbons," *Polymer Degradation and Stability*, 2004, v. 86, pp. 357-366.

Miskolczi N., Bartha L., Deák G., Jover B., and Kalló D., "Thermal and thermo-catalytic degradation of high-density polyethylene waste," *Journal of Analytical and Applied Pyrolysis*, 2004, v. 72, pp. 235-242.

Miskolczi N., Bartha L., Deák G., Jóver B., and Kalló D., "Thermal and thermo-catalytic degradation of high-density polyethylene waste," *Journal of Analytical and Applied Pyrolysis*, 2004, v. 72, pp. 235-242.

Mordi R. C., Fields R., and Dwyer J., "Gasoline range chemicals from zeolite-catalysed thermal degradation of polypropylene," *Journal of the Chemical Society, Chemical Communications*, 1992, pp. 374-375.

Mordi R. C., Fields R., and Dwyer J., "Thermolysis of low-density polyethylene catalysed by zeolites," *Journal of analytical and applied pyrolysis*, 1994, v. 29, pp. 45-55.

Muhammad C., Onwudili J. A., and Williams P. T., "Catalytic pyrolysis of waste plastic from electrical and electronic equipment," *Journal of analytical and applied pyrolysis*, 2015, v. 113, pp. 332-339.

Murata K., Hirano Y., Sakata Y., and Uddin M. A., "Basic study on a continuous flow reactor for thermal degradation of polymers," *Journal of Analytical and Applied Pyrolysis*, 2002, v. 65, pp. 71-90.

Murata K., Sato K., and Sakata Y., "Effect of pressure on thermal degradation of polyethylene," *Journal of Analytical and Applied Pyrolysis*, 2004, v. 71, pp. 569-589.

Musapatika T., Onyango M. S., and Aoyi O., "Cobalt (II) removal from synthetic wastewater by adsorption on South African coal fly ash," *South African Journal of Science*, 2010, v. 106, pp. 1-7.

Nabavi M. S., Zhou M., Mouzon J., Grahn M., and Hedlund J., "Stability of colloidal ZSM-5 catalysts synthesized in fluoride and hydroxide media," *Microporous and Mesoporous Materials*, 2019, v. 278, pp. 167-174.

Nicholas P. C., "Guide to Chemical Reactivity, Fire and Explosion," Handbook of Industrial Toxicology and Hazardous Materials, 1st ed., 1998.

North E. J., and Halden R. U., "Plastics and environmental health: the road ahead," *Reviews on environmental health*, 2013, v. 28, pp. 1-8.

Obalı Z., Sezgi N. A., and Doğu T., "Catalytic degradation of polypropylene over alumina loaded mesoporous catalysts," *Chemical engineering journal*, 2012, v. 207, pp. 421-425.

Ohkita H., Nishiyama R., Tochihara Y., Mizushima T., Kakuta N., Morioka Y., "Acid properties of silica-alumina catalysts and catalytic degradation of polyethylene," *Industrial & engineering chemistry research*, 1993, v. 32, pp. 3112-3116.

Olazar M., Lopez G., Amutio M., Elordi G., Aguado R., and Bilbao J., "Influence of FCC catalyst steaming on HDPE pyrolysis product distribution," *Journal of Analytical and Applied Pyrolysis*, 2009, v. 85, pp. 359-365.

Onu P., Vasile C., Ciocîlteu S., Iojoiu E., and Darie H., "Thermal and catalytic decomposition of polyethylene and polypropylene," *Journal of Analytical and Applied Pyrolysis*, 1999, v. 49, pp. 145-153.

Onwudili J.A., Insura N., and Williams P. T., "Composition of products from the pyrolysis of polyethylene and polystyrene in a closed batch reactor: Effects of temperature and residence time," *Journal of Analytical and Applied Pyrolysis*, 2009, v. 86, pp. 293-303.

Panda K., Singh R. K., and Mishra D., "Thermolysis of waste plastics to liquid fuel: A suitable method for plastic waste management and manufacture of value added products— A world prospective," *Renewable and Sustainable Energy Reviews*, 2010, v. 14, pp. 233-248.

Park D.W., Hwang E., Kim J., Choi J., Kim Y., and Woo H., "Catalytic degradation of polyethylene over solid acid catalysts," *Polymer degradation and stability*, 1999, v. 65, pp. 193-198.

Park J. H., Heo H. S., Park Y. K., Jeong K. E., Chae H. J., and Sohn J. M., "Catalytic degradation of high-density polyethylene over SAPO-34 synthesized with various templates," *Korean Journal of Chemical Engineering*, 2010, v. 27, pp. 1768-1772.

Park J., Park K., Park J. W., and Kim D. C., "Characteristics of LDPE pyrolysis," *Korean Journal of Chemical Engineering*, 2002, v. 19, p. 658.

Passamonti F. J., and Sedran U., "Recycling of waste plastics into fuels. LDPE conversion in FCC," *Applied Catalysis B: Environmental*, 2012, v. 125, pp. 499-506.

Perry H., and Green D. W., *Perry's Chemical Engineers Handbook*, 8th ed., 2007.

Pierella L. B., Renzini S., and Anunziata O. A., "Catalytic degradation of high density polyethylene over microporous and mesoporous materials," *Microporous and Mesoporous Materials*, 2005, v. 81, pp. 155-159.

Pinto F., Costa P., Gulyurtlu I., and Cabrita I., "Pyrolysis of plastic wastes. 1. Effect of plastic waste composition on product yield," *Journal of Analytical and Applied Pyrolysis*, 1999, v. 51, pp. 39-55.

PlasticsEurope, "An analysis of European plastics production, demand and waste data", *Plastics - the Facts*, 2017.

Prasad R., and Singh P., "Applications and preparation methods of copper chromite catalysts: a review," *Bulletin of Chemical Reaction Engineering & Catalysis*, 2011, v. 6, pp. 63-113.

Qiao K., Zhou F., Han Z., Fu J., Ma H., and Wu G., "Synthesis and physicochemical characterization of hierarchical ZSM-5: Effect of organosilanes on the catalyst properties and performance in the catalytic fast pyrolysis of biomass," *Microporous and Mesoporous Materials*, 2019, v. 274, pp. 190-197.

Ram L. C., and Mastro R. E., "Fly ash for soil amelioration: A review on the influence of ash blending with inorganic and organic amendments," *Earth-Science Reviews*, 2014, v. 128, pp. 52-74.

- Ranzi E., Dente M., Faravelli T., Bozzano G., Fabini S., Nava R., "Kinetic modeling of polyethylene and polypropylene thermal degradation," *Journal of Analytical and Applied Pyrolysis*, 1997, v. 40, pp. 305-319.
- Rehan M., Miandad R., Barakat M. A., Ismail I. M. I., Almeelbi T., and Gardy J., "Effect of zeolite catalysts on pyrolysis liquid oil," *International Biodeterioration & Biodegradation*, 2017, v. 119, pp. 162-175.
- Renzini M. S., Lericci L. C., Sedran U., and Pierella L. B., "Stability of ZSM-11 and BETA zeolites during the catalytic cracking of low-density polyethylene," *Journal of Analytical and Applied Pyrolysis*, 2011, v. 92, pp. 450-455.
- Saad J. M., Nahil M. A., and Williams P. T., "Influence of process conditions on syngas production from the thermal processing of waste high density polyethylene," *Journal of Analytical and Applied Pyrolysis*, 2015, v. 113, pp. 35-40.
- Sakata Y., Uddin M. A., and Muto A., "Degradation of polyethylene and polypropylene into fuel oil by using solid acid and non-acid catalysts," *Journal of Analytical and Applied Pyrolysis*, 1999, v. 51, pp. 135-155.
- Sakata Y., Uddin M. A., Koizumi K., and Murata K., "Catalytic degradation of polypropylene into liquid hydrocarbons using silica-alumina catalyst," *Chemistry letters*, 1996, v. 25, pp. 245-246.
- Sakata Y., Uddin M.A., Koizumi K., and Murata K., "Thermal degradation of polyethylene mixed with poly (vinyl chloride) and poly (ethyleneterephthalate)," *Polymer Degradation and Stability*, 1996, v. 53, pp. 111-117.
- San You Y., Shim J. S., Kim J. H., and Seo G., "Liquid-phase degradation of polyethylene wax over mordenite catalysts with different Si/Al molar ratios," *Catalysis letters*, 1999, v. 59, pp. 221-227.
- Sarker M. J., and Zaidi R. A., "Sustainability of energy sources in nordic countries-case study based on comprehensive analysis of different renewable energy sources," in 11th International Conference on Electrical Power Quality and Utilisation, 2011, pp. 1-5.

Sarker M., and Rashid M. M., "Waste plastics mixture of polystyrene and polypropylene into light grade fuel using Fe_2O_3 catalyst," *Int. J. Renew. Energy Technol. Res*, 2013, v. 2, pp. 17-28.

Sarker M., Kabir A., Rashid M. M., Molla M., and Mohammad A. D., "Waste polyethylene terephthalate (PETE-1) conversion into liquid fuel," *Journal of Fundamentals of Renewable Energy and Applications*, 2011, v. 1.

Scheirs J., and Kaminsky W., "Feedstock recycling and pyrolysis of waste plastics," John Wiley & Sons Chichester, UK, 2006.

Scott D., Czernik S., Piskorz J., and Radlein D. S. A., "Fast pyrolysis of plastic wastes," *Energy & Fuels*, 1990, v. 4, pp. 407-411.

Seo Y. H., Lee K. H., and Shin D. H., "Investigation of catalytic degradation of high-density polyethylene by hydrocarbon group type analysis," *Journal of Analytical and Applied Pyrolysis*, 2003, v. 70, pp. 383-398.

Serrano D., Aguado J., Escola J., and Garagorri E., "Performance of a continuous screw kiln reactor for the thermal and catalytic conversion of polyethylene–lubricating oil base mixtures," *Applied Catalysis B: Environmental*, 2003, v. 44, pp. 95-105.

Seth D., and Sarkar A., "Thermal pyrolysis of polypropylene: effect of reflux-condenser on the molecular weight distribution of products," *Chemical engineering science*, 2004, v. 59, pp. 2433-2445.

Shah J., and Jan M. R., "Thermo-catalytic pyrolysis of polystyrene in the presence of zinc bulk catalysts," *Journal of the Taiwan Institute of Chemical Engineers*, 2014, v. 45, pp. 2494-2500.

Shah J., and Jan M. R., "Thermo-catalytic pyrolysis of polystyrene in the presence of zinc bulk catalysts," *Journal of the Taiwan Institute of Chemical Engineers*, 2014, v. 45, pp. 2494-2500.

Shah J., Jan M. R., Mabood F., and Jabeen F., "Catalytic pyrolysis of LDPE leads to valuable resource recovery and reduction of waste problems," *Energy Conversion and Management*, 2010, v. 51, pp. 2791-2801.

Sharuddin S. D. A., Abnisa F., Daud W. M. A. W., and Aroua M. K., "A review on pyrolysis of plastic wastes," *Energy Conversion and Management*, 2016, v. 115, pp. 308-326.

Shent H., Pugh R., and Forsberg E., "A review of plastics waste recycling and the flotation of plastics," *Resources, Conservation and Recycling*, 1999, v. 25, pp. 85-109.

Siddiqui M. N., and Redhwi H. H., "Catalytic coprocessing of waste plastics and petroleum residue into liquid fuel oils," *Journal of Analytical and Applied Pyrolysis*, 2009, v. 86, pp. 141-147.

Smieskova A., Rojasová E., Hudec P., and Šabo L., "Aromatization of light alkanes over ZSM-5 catalysts: Influence of the particle properties of the zeolite," *Applied Catalysis A: General*, 2004, v. 268, pp. 235-240.

Sokol V., Maksimova N.V., Volkova N. I., Nigmatulina E. N., and Frenkel A. E., "Hollow silicate microspheres from fly ashes of the Chelyabinsk brown coals (South Urals, Russia)," *Fuel Processing Technology*, 2000, v. 67, pp. 35-52.

Songip R., Masuda T., Kuwahara H., and Ashimoto K. H., "Test to screen catalysts for reforming heavy oil from waste plastics," *Applied Catalysis B: Environmental*, 1993, v. 2, pp. 153-164.

Songip R., Masuda T., Kuwahara H., and Hashimoto K., "Kinetic studies for catalytic cracking of heavy oil from waste plastics over REY zeolite," *Energy & Fuels*, 1994, v. 8, pp. 131-135.

Sørnum L., Grønli M., and Hustad J., "Pyrolysis characteristics and kinetics of municipal solid wastes," *Fuel*, 2001, v. 80, pp. 1217-1227.

Srivastava R., Krishna V., and Sonkar I., "Characterization and management of municipal solid waste: a case study of Varanasi city, India," *Int. J. Curr. Res. Acad. Rev*, 2014, v. 2, pp. 10-16.

Stahel W. R., "The circular economy," *Nature News*, 2016, v. 531, pp. 435.

Syamsiro M., Saptoadi H., Norsujianto T., Noviasri P., Cheng S., and Alimuddin Z., "Fuel Oil Production from Municipal Plastic Wastes in Sequential Pyrolysis and Catalytic Reforming Reactors," *Energy Procedia*, 2014, v. 47, pp. 180-188.

Takuma K., Uemichi Y., and Ayame A., "Product distribution from catalytic degradation of polyethylene over H-gallosilicate," *Applied Catalysis A: General*, 2000, v. 192, pp. 273-280.

Tamizhdurai P., Krishnan P. S., Ramesh A., and Shanthi K., "Isomerization of hydrocarbons over Pt supported on micro-mesoporous ZSM-5," *Polyhedron*, 2018, v. 154, pp. 314-324.

Thongplang J., "What is BTEX and why is it important?" 2016. Available: <https://www.aeroqual.com/what-is-btex>

Thorat P., Warulkar S., and Sathone H., "Thermofurl—"Pyrolysis of waste plastic to produce liquid hydrocarbons", " *Adv Polym Sci Technol Int J. ISSN*, 2013, pp. 2277-7164.

Tiab D., and Donaldson E. C., "Experiment 3 - Density, Specific Gravity, and API Gravity," *Petrophysics (Second Edition)*, ed Burlington: Gulf Professional Publishing, 2004, pp. 773-776.

Tsuchiya Y., and Sumi K., "Thermal decomposition products of polypropylene," *Journal of Polymer Science Part A-1: Polymer Chemistry*, 1969, v. 7, pp. 1599-1607.

Uddin M. A., Koizumi K., Murata K., and Sakata Y., "Thermal and catalytic degradation of structurally different types of polyethylene into fuel oil," *Polymer degradation and stability*, 1997, v. 56, pp. 37-44.

Uemichi Y., Kashiwaya Y., Tsukidate M., Ayame A., and Kanoh H., "Product distribution in degradation of polypropylene over silica-alumina and CaX zeolite catalysts," *Bulletin of the Chemical Society of Japan*, 1983, v. 56, pp. 2768-2773.

Uemura Y., Azeura M., Ohzuno Y., and Hatate Y., "Flash-Pyrolyzed Product Distribution of Major Plastics in a Batch Reactor," *Journal of Chemical Engineering of Japan*, 2001, v. 34, pp. 1293-1299.

Wang Z., Sun Q., Wang D., Hong Z., Qu Z., and Li X., "Hollow ZSM-5 zeolite encapsulated Ag nanoparticles for SO₂-resistant selective catalytic oxidation of ammonia to nitrogen," *Separation and Purification Technology*, 2019, v. 209, pp. 1016-1026.

Weebly, "Facts about Ocean Pollution," 2018, Available: <https://canowindraenglish8.weebly.com/facts-and-statistics-about-plastics-in-the-ocean.html>

Williams A., and Williams P. T., "Analysis of products derived from the fast pyrolysis of plastic waste," *Journal of Analytical and Applied Pyrolysis*, 1997, v. 40, pp. 347-363.

Williams P. T., and Slaney E., "Analysis of products from the pyrolysis and liquefaction of single plastics and waste plastic mixtures," *Resources, Conservation and Recycling*, 2007, v. 51, pp. 754-769.

Williams T. and Williams E. A., "Fluidised bed pyrolysis of low density polyethylene to produce petrochemical feedstock," *Journal of Analytical and Applied Pyrolysis*, 1999, v. 51, pp. 107-126.

Woo S., and Broadbelt L. J., "Recovery of high-valued products from styrene-based polymers through coprocessing: Experiments and mechanistic modeling," *Catalysis today*, 1998, v. 40, pp. 121-140.

Woo S., Ayala N., and Broadbelt L. J., "Mechanistic interpretation of base-catalyzed depolymerization of polystyrene," *Catalysis Today*, 2000, v. 55, pp. 161-171.

Xie J., Meng W., Wu D., Zhang Z., and Kong H., "Removal of organic pollutants by surfactant modified zeolite: Comparison between ionizable phenolic compounds and non-ionizable organic compounds," *Journal of Hazardous Materials*, 2012, v. 231-232, pp. 57-63.

Zhang L., Bao Z., Xia S., Lu Q., and Walters K.B., "Catalytic Pyrolysis of Biomass and Polymer Wastes," *Catalysts*, 2018, v. 8, pp. 659.