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Pyrolysis of high density polyethylene (HDPE) over AlMCM-41 by TG and Py-GC/MS

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Plastic materials became an important part of solid urban waste. The disposal of these polymeric wastes involves different problems. Apart from their non-biodegradable character, their uncontrolled incineration produce serious problems in the environment. One interesting alternative is the pyrolysis of such materials in inert atmosphere operating under different conditions of temperature. With the use of catalysts in the process, it is possible to reach a higher selectivity to certain products, thus improving their quality and reducing the temperature of the process. The pyrolysis method for the catalytic recycling of waste is a promising way to convert polymer material into low molecular weight chemicals which can be used as raw materials for the chemical and petrochemical industry. In this work, was evaluated the catalytic degradation process of high density polyethylene (HDPE) using nanoporous catalysts type AlMCM-41. The kinetic relative to the HDPE degradation process was evaluated using Flynn Wall model, in order to verify the influence of the nanoporous materials on the pyrolysis process. Also, this work investigates the potential of using thermogravimetry (TG) and pyrolysis (Py) coupled to GC/MS as a fast screening method to study the thermal and catalytic degradation of plastic polymers in order to determine the nature of the products generated when the reaction is carried out in the presence of solid acids catalysts. The obtained results showed a remarkable effect the catalyst in acceleration the degradation processes. The kinetic parameters obtained revealed a reduction in the activation energy of the catalytic decomposition as compared to the thermal process. The products resulted from HDPE pyrolysis by MCM-41 are distributed in a narrow range of carbon, C_2-C_5, C_5-C_{10}, C_{11}-C_{15}, typically LPG, gasoline and medium distillate, evidencing that the pyrolysis mechanism is a function of the pore system and acid properties.

Biography

Valter J. Fernandes Jr. has completed his PhD at State University of Sao Paulo (1991) and postdoctoral studies from National Institute of Spatial Researches – INPI (2010). He is titular professor at UFRN, Brazil. He has published more than 100 papers in reputed journals.

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