Masks Thermal Degradation as an Alternative of Waste Valorization on the COVID-19 Pandemic: A Kinetic Study

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Abstract

Kinetic modeling of thermal degradation process by pyrolysis as an alternative for energy recovery of used masks generated by the COVID-19 pandemic. The masks were isolated for 72 h for virus inactivation and characterized by FTIR-ATR spectroscopy, elemental analysis, and higher heating value. Thermal degradation was performed by thermogravimetric analysis at different heating rates on an inert atmosphere. The gases produced were characterized by gas chromatography and mass spectrometry. The kinetic model was developed based on weight loss and calculated activation energies, reaction orders, pre-exponential factors, and thermodynamic parameters. The best fit models were established between the experimental and calculated data. Composition of the mask samples were polypropylene, polyethylene terephthalate, nylon 6, and Spandex, with higher calorific values than traditional fuels. The kinetic and thermodynamic parameters of the pyrolysis processes demonstrated the feasibility and high potential of recovery of these residues with conversions higher than 89.26 %.

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