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Utilization of solid sorbents for high temperature removal of halogenated compounds from pyrolysis of waste plastic

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Pyrolysis of waste plastics offers utilization of material that is not suitable for mechanical recycling process and is able to produce materials with higher added value. Other benefit of chemical recycling is the option to substitute current fossil feedstock in petrochemical industry or refineries.¹

Plastic materials can contain unwanted components and additives such as chlorine from PVC or bromine from flame retardants. These unwanted components or their parts can then transfer to final product (pyrolysis oil, gas), that could ultimately damage subsequent refinery technologies (e.g., catalysts damage, corrosion). Therefore, these halogenated compounds have to be reduced to very low concentration before utilization of the final product. Halogenated compounds are represented in the form of inorganic volatile substances (HCl, HBr) or halogenated organic compounds.^{1,2}

Possible way to remove halogenated compounds from pyrolysis gas before condensation is high temperature adsorption on solid sorbents.^{1,3}

This work focuses on high temperature removal of halogenated compounds in model mixture with hydrocarbons and other compounds. The study was performed in laboratory apparatus under controlled temperature and gaseous mixture composition. Solid sorbents for removal of halogenated compounds (HCl) from previous experiments⁴ are used in subsequent tests to estimate optimal conditions in the environment that is more similar to real application (water and hydrocarbon condensing phase). The results of the performed sorption experiments demonstrate the possibility of using some of the tested materials for the dehalogenation of pyrolysis gas. Particular sorbents show even better performance in presence of water vapor. Final purpose is to transfer laboratory results to the scale of pyrolysis unit operated by industrial partner.



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