THE INFLUENCE OF PRELIMINARY PREPARATION OF RAW MATERIAL ON YIELD OF THE LARGE LABORATORY AND INDUSTRY INSTALLATIONS OF POLYOLEFIN WASTE THERMODESTRUCTION

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INTRODUCTION

After the Second World War an intensive increase in the polymer production and usable products received from them has been observed. Currently polyethylene is the most used polymer material (about 39 weight %: HDPE ~ 17 %; LDPE and LLDPE ~ 11 %), while the other polymers: PP ~ 23 %, PVC ~ 18 %, PS and PET ~ 7 %, ABS ~ 4 % and PC 2 %. Most of the products made of these polymers has a short lifetime as a useful product. It is known that the used polyolefin products have a high calorific value (about 40 MJ/kg). They can constitute perfect energy materials. It was important to find a safe way of their management with the recovery of their chemical energy. Because of a strong social opposition against the direct combustion of used polymer plastic materials, receiving a mixture of hydrocarbons as a result of polyolefins thermo-destruction seems to be reasonable, public acceptable way of their management. The obtained hydrocarbons, due to their properties, are more widely used as fuel for directly combustion in suitable burners, for generator, as a raw material for processing into gasoline or as a raw material for the preparation of paraffin.

EXPERIMENTAL

The heretofore studies conducted on the experimental line at the Department of Environment Chemistry and Technology, Institute of Chemistry, University of Silesia, and installations for polyolefins thermo-destruction working on an industrial scale indicate that the course of thermo-destruction process and its yield depends on the way of preliminary

preparation of plastics for thermo-destruction process. It was decided to verify the results of research in this field conducted in the large laboratory scale in industrial installations. Wet and dry waste PE foil is used as a raw material for the large laboratory installation.
In one of the industrial installation in Poland the studies of course of the thermodestruction process of polyolefin waste were conducted with different content of damp and dirty and clean film in plastic input. For studies of the thermodestruction process in the other installation in Poland material from the same source (dirty and very moist), pre-prepared and without preparation was used.

RESULTS AND DISCUSSION

In the large laboratory installation the influence of the presence of water on the course of thermodestruction process was observed. The change of material moisture caused a slight increase in the efficiency from 78.9 % for the wet waste to 82.1 % for a dry waste and a significant decrease in the solid residue content after the thermodestruction process. Process was also much faster (by about 25 %) without the temperature jumps observed for the wet foil. Studying the thermodestruction process on four modules of the vertical installation the highest yield (73.6 %) subjecting the thermodestruction of plastic input containing the highest content of pure waste (40 %) was obtained. The lowest yield (52.8 %) was obtained for input with almost 80 % of dirty, damp waste. It was stated that the introduction of preliminary preparation of material for themodestruction process allowed to improve the efficiency from 60 % (using material without preliminary preparation) to about 85 % for pre-prepared material.

CONCLUSION

The research of polyolefins termodestruction conducted on laboratory and industrial installations show a high correlation between the quality of raw material and the course and efficiency of the thermodestruction process.

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