Experimental Electrostatic Separator for Plastic Mixture

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Abstract **The paper deals with the verification of the experimental electrostatic separator. Some individual industrial plastic materials are experimentally verified for finding of the direction of deflection of particles. On this basis it is selected one mixture of particles for the verification of functionality of this experimental device. A mixture consisting of thermoplastic copolyester (TPC) and the acrylonitrile butadiene styrene (ABS) is used for the experiment. The goal of the experiment is to find out a efficiency and a purity of the separation.**

Keywords **Electrostatic separator, triboelectric series, thermoplastic copolyester, acrylonitrile butadiene styrene.**

I. Introduction

Nowadays, recycling of plastic materials is very important because the production of plastic products increases constantly and approximately 15 % of the whole produced waste is plastics. Therefore an intensive research is aimed at the possibilities of recycling plastic materials [1].

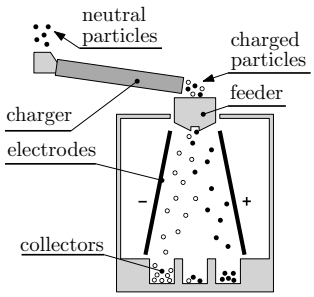

Fig. 1. Basic arrangement of free-fall triboelectric separator

II. Formulation of the technical problem

Neutral plastic particles are charged by friction in a charger. Particles of different materials accept different amount of charge (positive or negative), which depends on the positions of the particular material in the triboelectric series. The voltage on electrodes is on 45 kV. The plastic particles are deflected to either positive or negative electrode according to the polarity of their charge and fall down into collectors [2].

III. Experiment

At first each experimental measurement was performed always with 100 g of industrial grains of each individual plastic material. The particles moved approximately 120 s through the charger rotating at 200 rpm. On the basis of these measurements we could compartmentalize which materials are charging negatively and which positively. For demonstration that the separator is able to work also with mixture, it was selected the TPC and the ABS. The mixture was composed from 50 g of the TPC and 50 g of the ABS (i.e. together 100 g).

TABLE I
Plastic material and its polarity of charge Q

-Q	+Q
PET	$HDPE$
TPC	PS
PC/ABS	ABS
$PS\,fridge$	PVC
$PA6 + PA6.6$	$PVC + ABS$
POM	$-$

TABLE II
Results of separation for mixture of plastic particles

Bin	Total mass	TPC mass	ABS mass	Eff.	Pur.
Left	46.47 g	2.67 g	43.80 g	88 %	94 %
Right	47.87 g	45.79 g	2.08 g	92 %	96 %

Total efficiency	Total purity
90 %	95 %

IV. Conclusion

Directions of deflections were found for different kind of plastic samples that were tested in the separator. On the basis of these measurements there were divided the plastic materials according to the polarity of theirs charge. The last experimental measurement was performed with the mixture of TPC and ABS plastic material. The first results indicate the potential of further raising the efficiency and the purity of separation.

V. Acknowledgements

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