Electrostatic separation of HIPS/ABS and HIPS/ABS-PC plastic mixtures from IT equipment using fluidized bed tribocharging

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Introduction

Plastic waste in EU 25.8·10⁶ tons/year

collected for recycling: less than 30 %



Non Packaging Household: 4%

different type of plastics should not be mixed

Plastic from WEEE: highly engineered includes additives bounded with complex products more than one types of polymer

Triboelectrostatic separation Separation of "plastic - plastic" mixtures

- Tribocharging of the plastic mixture
- Separation in high intensity electric field



Fluidized bed tribocharging device



Tribocharging process

- The granular material is maintained in fluidized bed by the action of the vertical air flow
- Granules get charge by repeated collisions with each other
- Granules of different material acquire charge of opposite polarity (triboelectric series)

Materials



The market value of the recycled ABS, HIPS and ABS-PC is much higher if they are separated from each other

Experimental setup and Method



Preliminary experiments

- Choosing the material of the tribocharging chamber
- Setting the optimal tribocharging time

Better triboelectrification is obtained if the chamber's walls give the granules the same charge polarity as by collision with granules of the other component The granules charge increases non-linearly with the tribocharging time and presents a saturation tendency

Tribocharg	Charge polarity of the granules		
ing chamber material	ABS (black)	ABS-PC (green)	HIPS (white)
ΔΙ	negative	negative	negative
PET	positive	positive	negative
РР	positive	positive	positive



Results and discussion Separation of balanced (50% - 50%) HIPS/ABS-PC mixture



Box no.



Results and discussion Separation of a heavily unbalanced mixture

(90% - 10%) HIPS/ABS-PC





HIPS CONCENTRATE: Recovery HIPS 99.6%; Purity HIPS 99.6%

Results and discussion

Separation of a heavily unbalanced mixture (10% - 90%) HIPS/ABS



Conclusions

- The experimental results confirm the feasibility of the separation of HIPS, ABS-PC, and ABS originated from IT waste in the free-fall electrostatic separator, with prior tribocharging in a fluidized bed device
- The highest recovery rates and purities were obtained for balanced mixtures
- In the case of heavily unbalanced mixtures high recovery rate and purity close to 100% were obtained for the majority material concentrate, while the minority material concentrate has high recovery rate but lower purity
- A second triboelectrostatic separation of the minority material concentrate improves significantly the quality of the separation products

Thank you very much !

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