
Reviewer 5 - Answers**Publication title:**

"Analysis of selected properties of polymer materials derived from recycled overprinted metallized films"

Based on comments provided by another reviewer, the title of the publication was changed.

New title :

"Analysis of selected mechanical and thermal properties of polymer materials derived from recycled overprinted metallized PP films"

Manuscript ID materials-2933259

Authors : Tomasz Stachowiak, Przemysław Postawa, Marcin Chmielarz, Dominik Grzesiczak

Dear Reviewer

At the outset, I would like to thank you for the prepared review. Thank you very much for the extensive study containing such a large amount of valuable information, which will significantly influence the quality not only of the submitted publication but also of future work. I agree with all the comments (which I post below).

Comments and Suggestions for Authors

I find that the paper entitled: "Analysis of selected properties of polymer materials derived from recycled overprinted metallized films" is a very interesting. According to statistical data from Plastics Europe, approximately 40 % of processed thermoplastics are used to produce packaging, including single- and multi-layer film packaging. Growing requirements and new EU directives require the use of recycled materials in new products, which is not easy because the properties of recyclates may differ significantly from those of the primary materials with which the former are mixed. Polymer plastics and their composites are one of the most frequently used materials in the packaging and food industries: disposable and reusable packaging, layered films with barrier properties, as well as densely overprinted polymer films and metallized food wrap films. Their disposal is a major environmental problem.

In this paper was presented the research of properties of the primary material used to produce film using the casting method in comparison with the industrial recycle obtained by the processing of film made of the primary material and then overprinted and metallized. The process of obtaining re-granulates and preparing test samples was presented, and the mechanical, structural and thermal properties of the tested materials were compared.

The research has shown that a properly carried out recycling process leads to obtaining a full-fledged product (re-granulate) that does not differ significantly from re-granulate containing no inclusions. As shown by the analysis of the mechanical properties, the obtained re-granulates and the standardized samples containing impurities (metallization residues) are characterized by better static mechanical properties, higher hardness and slightly lower impact strength. The tests have also shown that the content of impurities may affect the processability of the tested polymer materials. Contamination in the form of metallization and overprinting residues leads to deterioration of processability factors (defined by the melt flow index). An in-depth analysis of the physical properties of the primary materials and re-granulates obtained from waste from the metallized film production process allows us to conclude that the obtained properties do not differ significantly from the properties of the primary material to such an extent that its reuse would be impossible. There is a visible impact of subsequent technological processes related to recycling (agglomeration and re-granulation) in the form of a slight deterioration of certain properties of re-granulates.

I support future work involving analysis of the behavior of recycled materials which necessary for a better and more informed selection of such feedstock for future industrial applications.

I agree that research described confirms full usefulness of this type of materials and the results obtained do not have not revealed any limitations on their functionality in such applications.

Accordingly, I recommend the accept of paper in present form.

Answer: Dear Reviewer, on behalf of myself and my co-authors, I would like to express gratitude for the opinion provided in the review. We would also like to thank you for your efforts in preparing the review. In subsequent publications, we want to develop and analyze recycling issues.