



GENERAL NOTICE 72

Impact of SiOx on the regeneration of flexible PE household packaging

SUMMARY

The aim of this general notice is to assess the impact on mechanical regeneration of flexible PE household packaging with a silicon oxide (SiOx) barrier.

In addition to this notice, sorting tests will also be performed on flexible PE with a SiOx barrier to assess whether they can be directed to regeneration plants.



Sorting centre

Ability of packaging waste to be channelled to the regeneration plant




Regeneration

Ability of packaging waste to be converted into ready-to-use flakes or granulate



Use of recycled material

Ability of flakes or granulate to be converted into new products

 Study scope

The outcomes of these pilot-scale tests show that a SiOx barrier does not disrupt the mechanical flexible PE regeneration process, i.e. conversion into granulate, at proportions of 1% and 5%. However, in films produced containing PE with a SiOx barrier layer, there was a deterioration to mechanical properties and/or suitability for sealing which may limit outlets for recycled materials.

As such, given the current state of equipment and techniques used in France, a SiOx barrier in flexible PE offers limited compatibility with flexible PE regeneration. This opinion may be reviewed with regard to technological and market developments if needed.

1. CONTEXT

Silicon oxide (SiOx) is a transparent coating applied to flexible PE giving it barrier properties which offer superior product protection and preservation. This notice concerns the application of a SiOx barrier by vacuum deposition, which enables an ultra-thin layer of a few angströms to be applied to the film.

A PE film coated with a SiOx layer provides an excellent moisture and oxygen barrier that can meet market needs for products such as crisps, savoury snacks, pet food, biscuits, chocolate, etc. This barrier film is used in combination with a sealant film to produce pouches or bags.

This notice seeks to assess the impact of a SiOx barrier in flexible PE packaging on mechanical regeneration and the quality of the recycled material.

2. IMPACT ON REGENERATION

2.1. Principle and analytical criteria

In its mechanical regeneration study, COTREP assessed the impact of flexible PE with a SiOx barrier on the regeneration process and on the quality of recycled PE (rPE) produced from flexible household packaging.

These tests were performed on a pilot scale based on protocols defined by COTREP for recycling flexible PE packaging. The protocols are representative of industrial practices applied by regeneration plants processing streams in France.¹

Various physical-chemical criteria were measured during the test phases and compared to those of a standard sample composed of 100% rPE.

2.2. Test samples










Tests were performed on a complete packaging item representative of structures available on the market. The film chosen is composed of a PE film to which a SiOx barrier has been applied and laminated with a PE sealant film. The adhesive used for lamination is a polyurethane in standard use in flexible PE packaging.

A 100% rPE film was produced exclusively as the standard film for the study from granulate sourced from a regeneration process using packaging waste generated by the French selective collection system (flexible PE standard).

Tests were performed on multilayer PE with proportions of SiOx barrier of 1% and 5% by mass to account, respectively, for current marketing and marketing potential in 2025.

2.3. Results

IMPACT OF SIOX ON MECHANICAL FLEXIBLE PE REGENERATION PROCESSES

RECYCLING PROCESSES	IMPACT	DESCRIPTION
 SHREDDING		<i>No impact on shredding</i>
 WASHING AND SPINNING		<i>No impact on washing and spinning</i>
 FLOTATION AND DRYING		<i>No change to the flotation water or residual elements on flakes. No impact on flotation and drying</i>
 EXTRUSION/ GRANULATION		<i>No impact during manufacture of granulate at concentrations of 1% and 5%. The resulting MFIs are compliant</i>
BLOW EXTRUSION		<i>No impact on the blow extrusion process with proportions of 1% and 5%. However, the mechanical properties and/or suitability for sealing of the films produced are affected</i>

 Caution
  No impact

¹ For further information, see protocols Flexible PE-1 and Flexible PE-2 on the COTREP website: www.cotrep.fr

TECHNICAL CONCLUSIONS

Through tests performed by COTREP, it was possible to assess the impact of a SiOx barrier in flexible PE on mechanical regeneration of flexible PE packaging.

Results obtained show that the presence of SiOx does not disrupt the mechanical flexible PE regeneration process, i.e. conversion into granulate, up to a proportion of 5%. However, the mechanical properties and/or suitability for sealing of the films produced from this granulate are affected. The films produced are more difficult to seal and this limits outlets for recycled materials.

It should be noted that the appearance of the films produced was not assessed in this test. A further study may be performed to supplement this notice.

Given the current state of equipment and techniques used in France, a SiOx barrier in flexible PE offers limited compatibility with mechanical flexible PE regeneration. This opinion may be reviewed with regard to technological and market developments if needed.