Tray Circularity Evaluation Platform

Quick Test QT 504 Glue separation test

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1. Introduction

The objective of the Tray Circularity Evaluation Platform (TCEP) is to evaluate technologies and products to allow new PET Tray innovations whilst optimizing the environmental and economic consequences for the recyclability of PET.

TCEP has formulated guidelines to evaluate the influence of Tray innovations - such as barrier materials, resin formulations, additives and non-PET components in or on PET Trays - on R-PET recycling processes. Barrier materials can be applied as a coating, introduced in a co-injected multilayer configuration or blended with the matrix material. Additives can be incorporated into the base material during polymerization or added during injection molding in the form of liquid or solid master-batches. Other non-PET components can be labels, glue, sleeves, caps, printings, etc.

Laboratory analyses on the recyclability of new innovative PET Trays can be relatively expensive and usually have a time delay between sampling and getting useable results of several months. Besides, assessing the test results is a difficult task that requires training and experience. This is often seen as an inconvenience.

For this reason, TCEP has developed a series of rapid and low-cost techniques for the quick assessment of PET Trays. All quick tests include a complete explanation of the scope, techniques, equipment and test conditions, as well as a “summary interpretation” explaining how to use the test results. Quick tests can either be executed at the internal laboratory facility or by an independent test laboratory with minimal investment in equipment.

The results of the quick tests are purely indicative, and may not be considered as an advice, a recommendation or a formal approval by TCEP. For a complete assessment, further tests are required to highlight all possible effects of innovative PET Trays on the recyclability of collected Trays into r-PET, the processing of the r-PET into products and the final product properties. Please contact TCEP for more information.

SAFETY PRECAUTIONS
This guideline is intended for use by qualified personnel who recognize safety hazards and are familiar with the safety precautions required in regard to application of this guideline. The appropriate laboratory safety procedures must be used before, during, and after testing operations.

2. Quick Test QT 504

Scope
Several types of adhesives can be used to fix a label on a PET Tray. The following test protocol is designed to provide guidance on the removability of adhesives on PET Trays during the recycling process. Label adhesives that leave remnants of the label and / or adhesive should be avoided.

Principle
Label adhesives are the most readily removed during the hot (pre-)wash of the recycling process. The Trays / flakes are put into a hot caustic solution, where the adhesives are dissolved or dispersed, breaking the bond with the PET surface, detaching the labels from the PET Trays. The efficiency of the adhesive removal is determined by the mass loss for the test sample.

Apparatus
- Oven with forced air circulation, with a maximum temperature of 250°C
- Grooved spade to apply glue according to suppliers' instruction
- Beaker of 1000 ml
- Hot plate stirrer, or similar equipment
- Clamping device
- Analytical balance, accurate to 0,0001 g
- 2% caustic soda solution

Sample
Cut out 5 strips of PET (from the length of the Tray) of approx. 80 mm by 20 mm, and mark each strip with a sharp object (A, B, C, D).

Procedure
- Wash samples with cold demineralized water
- Dry samples for 2 hours at 85°C
- Cool to room temperature, weigh each strip and record the individual weights (W1)
- Apply the adhesive evenly on 3 PET strips according to the supplier's instructions (for amount, thickness, temperature, etc). Keep 2 strips as reference sample.
- Dry samples for 1 hours at 85°C
- Cool to room temperature, weigh each strip and record the individual weights (W2)
- Wait at least 24h before carrying out the glue separation test.
- Place samples with clamping device completely submersed in 800 ml 2% caustic solution of 70°C, switch on magnetic stirrer to 500 rpm and leave for 8 minutes
- Important: make sure that the coated strip(s) do neither stick to the mesh at the bottom, to the sides of the beaker glass, or to each other
- Rinse samples in stirred cold demineralized water for 3 minutes
- Dry samples for 2 hours at 85°C
- Cool to room temperature, weigh each strip and record the individual weights (W3)

Results
The efficiency of the adhesive removal is calculated as follows:
Glue removal = (W2-W3)/ (W2-W1) x 100 (in %).

Optional
This quick test QT 504 can be followed by an oven test on the PET strips (see Quicktest QT 500).

Test report

The test report includes the following information:

- Reference to the TCEP Quicktest QT 504
- All details necessary for complete identification of the material tested
- Description and detailed photos of the samples before, during and after testing (especially on color changes, haze, peel off pieces, etc.)
- Adhesive removal efficiency of each sample, as well as the average efficiency
- Details of any deviation from the test method, as well as any incident which may have influenced the results
- Date and place of the test.

Remark

This quick test is designed as a quality indicator to monitor a single critical parameter in PET recycling. Other specific tests are needed to carry out a full screening for possible effects of innovative PET Trays on the recyclability of collected Trays into r-PET, the processing of the r-PET into products and the final product properties. Please contact TCEP for more information.

Photos

Photo 1: PET strip, glue and putty

Photo 2: Analytical balance to weigh sample before washing (W1)

Photo 3: Glue removal setup with sample immersed in caustic soda solution

Photo 4: Dry sample for 2 hours at 85°C (W1)

Photo 5: Analytical balance to weigh sample after washing (W3)