Guidelines for recycled PET test

Polyester are a man-made fiber, synthesized from petrochemical products by a process called polymerization. Nearly half of the world's clothing is made of polyester and some organizations indicate this amount to nearly double by 2030. Under this background, polyethylene terephthalate (PET) ,as a majority of polyester used in textile, rPET is definitely a sustainable option for our wardrobe, as their production requires far fewer resources than that of new fibers and generates fewer CO_2 emissions. By far, apparels and retail companies have taken great effort to increase their use of rPET, including giants like Adidas, H&M, Gap and Ikea.

In the past, due to the lack of inspection methods and the inability of testing agencies to issue qualitative reports, enterprises could not enjoy the benefits of relevant national policies, and at the same time caused confusion in the labeling of some polyester products. Therefore, a national standard GB/T 39026-2020 <Method for Identification of Recycled Polyester (PET) Fibers> was released on July 21, 2020 and was officially implemented on February 1, 2021, which filled the domestic and foreign gaps in the field of recycled polyester.

In May 2022, the technical team of CTI developed a semi-quantitative and quantitative analysis method for determining the proportion of rPET in samples, which are made from PET bottle flakes，after a series of comparative analysis of PET bottle grade chip, recycled and virgin PET fiber.

Service of CTI

Item	Test Method	Sample Amount	Test Period	Price
Identification of rPET	GB/T 39026-2020	30g	5 working days	2000RMB

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Item	Test Method	Sample Amount	Test Period	Price
Quantitative analysis of rPET	CTI in house method	30g	5 working days	3000RMB
Semi-quantitative analysis of rPET	CTI in house method	30g sample 30g PET bottle flakes	7 working days	5000RMB
Note： Please provide fiber composition for blended samples. Semi-quantitative and quantitative analysis for PET bottle flakes recycled samples only. Please provide material and product consistency statement for quantitative analysis of rPET.				

Identification of rPET

Principle:

According to the difference between recycled polyester and virgin polyester due to the production process, the test sample is detected by high performance liquid chromatography after pretreatment, and the regenerated poly- ester is identified based on the difference of the relative peak area of the sample at different retention time.

Test procedure:

① Methanol Alcoholysis

0.8g sample + 25ml transesterification solution → 220±5℃ 2h → Cool to RT (room temperature), then filter the solution → 4-6℃ ＞8h → Filter the solution, then recover to RT → Analysis by HPLC

② Swelling-Extraction

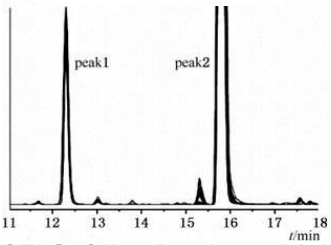
1.4g dry sample + 35ml solution → 180±5℃ 90min → Cool to RT , then go through centrifu-gal filtration → 4-6℃ ＞8h → Filter the solution, then recover to RT → Analysis by HPLC

③ Calculation

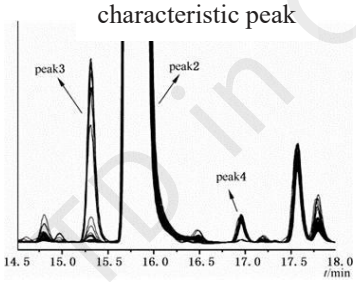
Calculate the discrimination function and accuracy based on the positioning peak and the characteristic peak.

Methanol Alcoholysis

positioning peak

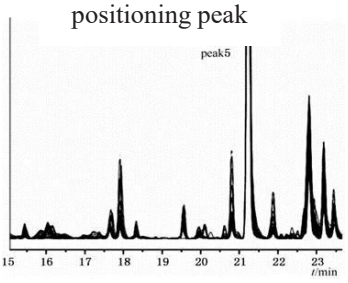


characteristic peak

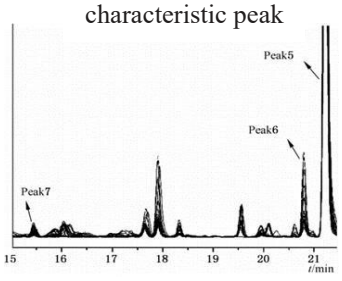


Swelling-Extraction

positioning peak



characteristic peak



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Semi-quantitative and quantitative analysis of rPET

Adding isophthalic acid (IPA) in bottle grade PET bottle flakes, on the one hand, can reduce the regularity of PET, so that its crystallization speed, processing temperature is reduced, on the other hand, can increase the transparency of bottle. Therefore, IPA can be detected for polyester products recycled from bottle flakes, and the content of IPA is relatively stable.

Semi-quantitative analysis — The content level of rPET in the sample was obtained, according to the ratio of IPA value between the sample and the purely recycled PET material.

According to R(IPA) value, the interpretation of semi-quantitative analysis of rPET are as follows.

R(IPA)	Interpretation
＞75%	Close to purely recycled PET material
≤75%, ＞25%	Partially recycled PET material
≤25%, ＞1%	Low content of recycled PET material
≤1%	Not recycled PET material

R(IPA) value means the ratio of the IPA value of the sample to the IPA empirical value of the purely recycled PET material.

Quantitative test — IPA values of bottle flakes and samples were detected, and significant comparison was made between the test results of bottle flakes and samples, so as to obtain the content of rPET in the samples.

Where, IPA value is the ratio of isophthalic acid units in the material structure to total phthalic acid units.

Details of the Technical Content

For more information, please refer to the national standard GB/T 39026-2020 Method for Identification of Recy- cled Polyester (PET) Fibers, or contact CTI directly. As a professional third-party testing organization, CTI has mastered the latest global laws and regulations, which can assist enterprises to manage the products to meet the requirements of target markets.

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