



TEST REPORT

S1305-01 Adhesive Color Verification

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TEST REPORT

PRODUCT	S1305-01 (PN 658409-000)
SPECIFICATION	
REPORT NUMBER	501-160799
TEST DATE	September 15, 2022
BATCH NUMBERS FOR S1305-01	0224200534 0224208316 ORDER 588038-02
TUBING MANUFACTURING SITE	Redwood City, California USA
TESTING LABORATORIES	Fremont, California USA
REFERENCE NUMBERS (IF AVAILABLE)	CLIM 23382, 3, 4 (21438 PAGE 26) AND CLIM 23404, 5, 6 (21438 PAGE 27)

PURPOSE

The purpose of this testing was to determine whether S1305-01 from batches 02242000534 and 0224208316, which are grey, were made of butyl rubber and matched S1305-01 from order 588038-02, which is black.

CONCLUSION

The results on the following pages demonstrate that the adhesive material is the same for the three batches of S1305-01 that were analyzed. Each characterization technique independently suggests that the materials are the same, and the combination of the thermal and chemical functional group data confirms that they are indeed the same.

TESTING SCOPE

Differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and Fourier transform infrared spectroscopy (FTIR) were used to characterize three samples of S1305-01 provided by nVent.

APPROVAL

Report approved electronically via PDM link / RTS.



Background

TE's customer received two batches of S1305-01 adhesive tape that were grey in color when previous batches were black. The customer asked TE to confirm that the two batches of grey material were made from butyl rubber and matched the composition of the black tape. The customer sent TE three rolls of adhesive tape for testing; two rolls of grey tape from different batches as well as a roll of the black tape.

Techniques

Fourier-transform infrared spectroscopy (FTIR): used to identify chemical functional groups. This will confirm the chemical structure of the base polymeric material in each tape.

Differential scanning calorimetry (DSC): used to measure the thermal transitions of polymeric materials. This data provides information on the structure, molecular weight, and molecular weight distribution of a polymer.

Thermogravimetric analysis (TGA): used to measure the decomposition characteristics and weight percent of inorganic additives in materials. This is used to confirm the formulation of the material.

Results

FTIR Analysis

The plots of % Transmittance versus Wavenumbers (cm^{-1}) for the three adhesive samples in Figure 1 demonstrate that the chemical functional groups are the same in each tape. This demonstrates that same polymer system is present in each sample.

Thermal Analysis

The thermal transitions of the three tape samples were measured by DSC. Only one transition was observed in each of the three samples, a glass transition temperature (T_g). For each the three samples, the T_g was the same (see Table 1). Since FTIR showed that the same polymer system is present in each sample, the DSC measurement confirmed that the polymer is of the same molecular weight and has the same molecular weight distribution.

The decomposition characteristics of the three tape samples were measured by TGA. The onset of degradation, a value calculated by extrapolation, is effectively the same for each sample. In addition, the weight loss and residue characteristics match each other. This data demonstrates that the formulation for the three tape samples is the same.



Figure 1. Graphs of % Transmittance vs. Wavenumber (cm⁻¹) for three batches of S1305-01. Order 588038-02 (black tape) is in purple, batch 0224200534 (gray tape) is in green, and batch 0224208316 (gray tape) is in red. Test conditions are documented below

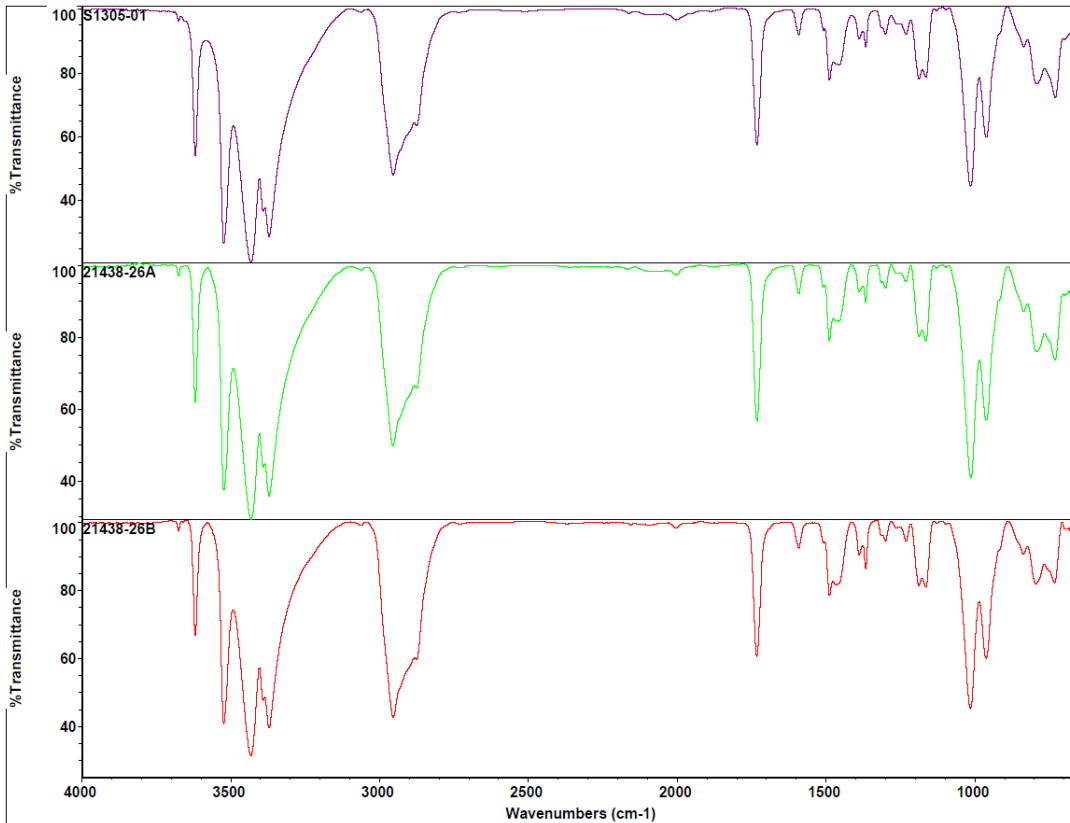


Table 1. Results from DSC and TGA analysis of three batches of S1305-01. Test conditions are documented below.

Batch	Glass Transition Temperature (T _g)	Onset of Degredation	Weight loss at 600 °C in N ₂	Residues
	(°C)	(°C)	(%)	(%)
0224200534	-44.4	278	58	41
0224208316	-44.3	276	59	40
ORDER 588038-02	-44.6	273	59	41

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Conclusion

Three complimentary techniques, FTIR, DSC, and TGA, were used to characterize three different batches of S1305-01. The measurements confirm that the three batches are made from the same base polymer, butyl rubber, that has the same molecular weight characteristics between the three batches, and the three batches are formulated at the same weight percentages.



Key Equipment Used		
Property	General Test Equipment Tool Used	Procedure
Functional Groups	Nicolet iS50 spectrometer with Smart iTX-diamond	32 scans, 4 cm ⁻¹ resolution; ATR and baseline corrected.
Thermal Transitions	TA Discovery DSC2500	-80 °C to 100 °C at 10 °C/min.
Decomposition / Residue Analysis	Seiko (Hitachi) TG/DTA7300	Heat at 20 °C/min from 20-800 °C, hold for 5 minutes at 400 °C and 600 °C. Use N ₂ up to 600 °C, and switch to air from 600-800 °C. Hold for 10 minutes at 800 C.