Siemianowice Śląskie 30.10.2019.

RESEARCH REPORT No. LT/399/2019

Subject: Flammability testing of PE-based composite filled with textile fibres

Principal:

VIVE Textile Recycling Sp. z o.o.
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Research Report No. LT/399/2019

1. Contract/commission/order number:

Confirmed bid No. L.dz. JSHT/1340/W/09/2019/MZ

2. Oata and location of the study:

29.10.2019 r.

J.S. Hamilton Poland Sp. z o. o. - Research Laboratory 14
Wyzwolenia Street, 41-103 Siemianowice Śląskie

3. Description, status and identification of the study object

3.1. Product manufacturer:

No data available

3.2. Description and condition of the study object:

Tade/a *1.*

Description and condition of the study object Test objects in the form of material samples from recycled raw materials as in Figures 1 and 2 with dimensions as in 5.1 and 5.2.	
Identification of the object: Factory no: Lab designation: Year of production:	Material samples from recycled materials LT/399/19/1/1+26 - brown colour samples LT/399/19/2/1+26 - green colour samples
Documentation: ––	

Fig. 1. View of the object under study No. LT/399/19/1

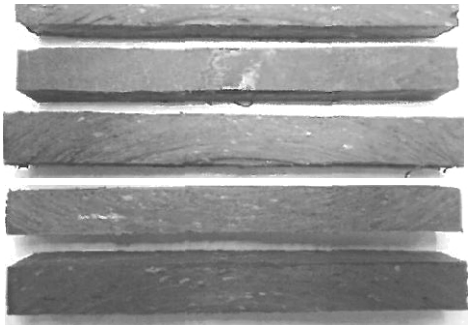
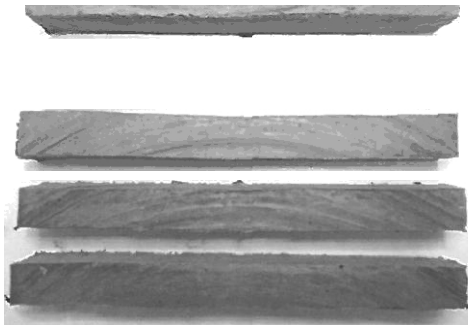


Fig. 2. View of the test object No. LT/zg9/19/2



4. Scope of research

Table 2 Scope of the study

Parameter tested	According to **standards/documentation**
Determination of flammability category - method A	PN-EN 60695-11-10:2014-02
Determination of flammability category - Method B	

Table 3 List of apparatus used for testing

Name of apparatus	No. inventory/fabric
Thermohygrobarometer LB-706B	C/001/LT
Thermohygrometer LB-701	C/002/LT
Flammability test bed	C/117/LT
Roll-up gauge	A/066/LT
Calliper	A/109/LT
External micrometer	A/142/LT
Laboratory dryer	C/161/LT
Electronic seconds hand	A/010/LT
Climate chamber DISCOVERY DY 1200C	C/023/LT
Rotameter	A/122/LT

The measuring apparatus was checked before the tests; the apparatus was in working order.

5. Course and results of the study:

5.1. Determination of flammability category - method A

Environmental conditions during the study affecting the results of the study:
The tests were performed at a temperature of (21.9¿0.2) °C and a relative humidity of (46.7+2.0) %. The testing was carried out in accordance with PN-EN 60695-11-10:2014-02

The results of the study are shown in Tables 4 and 5. Study

parameters:

1) Sample description: 4 sets of 3 specimens with dimensions: 124+125 +1 mm (length), 14.42+14.83 +0.5 mm (width),
   12.78+13.42 -£0.5 mm (thicknessG)
2) Conditioning: 48h at 23+1°C and 50¶4% relative humidity.
3) Sample attachment method: without support.
4) Flame source: flame A according to 60695-11-4:2012, gas - methane.

Table 4. Fire *hazard* test *result - method* A, sample *designation* LT/399/19/1/21-26

Sampl e number	Flame application time l	The way the sample burns	Achieved marker 25 mm	Burning time from the 25 mm marker t [sJ	Burning distance from the marker 25 mm L l++l	Achieved marker 100 mm	Falling burning parts	Linear palenla speed 'v = 60*L / t[mm/min].
1	23,08 +1	flame	yes	146,00	75	yes	not	30,82
2	25,09 ż1	flame	yes	216,33	75	yes	not	20,80
3	25,70 +1	flame	yes	169,94	75	yes	not	26,48

Based on the test results obtained in accordance with para. 8.4.2. of PN-EN 60695-11-10:2014, the tested material was classified as HB.

Table 5. Fire hazard test result - method A, sample designation LT/399/19/2/21--26

Sampl e numbe r	**Time** flame application	The way the sample burns	Achieved marker 25 mm	Patency time from marker 25 mm t [sJ	Burning distance from the marker 25 mm L [mm]	Achieved marker 100 mm	Falling burning Particles	Linear burning rate v= 60*L/ t[mm/min] .
1	18,97+1	flame	yes	128,31	75	yes	not	35,07
2	29,18+1	flame	yes	147,41	75	yes	not	30,53
3	30,00ź1	flame	yes	155,96	75	yes	not	28,85

Based on the test results obtained in accordance with para. 8.4.2. of PN-EN 60695-11-10:2014, the tested material was classified as HB.

5.2. Determination of flammability category - Method B

Environmental conditions during the study affecting the results of the study:
Tests were performed at a temperature of (22.2+0.2) °C and a relative humidity of (46ź7.0) % The test was performed in accordance with PN-EN 60695-11-10:2014-02

Test parameters:

1) Number of samples: 4 sets of 3 samples with dimensions: 124+125 -£1 mm (length), 14.13+14.52 +0.5 mm (width),
   12.64+13.25 +0.5 mm (thickness)
2) Conditioning:
   a. Set I - *LT/399/19/1/1-10* - for 48 h at 23+2°C and 50+10% relative humidity;

a. set I - *LT/399/19/1-' 10* - for 48 h at 23ź2°C and 50-£10% relative humidity;
b. set II - *LT/399/19/1/11-' 20* - for 168 h at 70*1°C and then subjected to cooling in a desiccator for 4 h.;
c. Set III - *LT/399/ź9/2/1-'10*- for 48 h at 231-2°C and relative humidity 50+10%;
d. Set IV - *LT/399/19/1/11--20*- for 168 h at 70+1°C and then quenched in a desiccator for 4 h.

3) Flame source: flame A according to 60695-11-4:2012, gas - methane.

Observations: When the flame was applied, the test specimen occupied the fire and burned up to the handle.

Table 6. Fire hazard test result - method B - set I, sample designation LT/399/19/1/1-'10

Number tests	Czas t_1	Czas t_2	Czas t_3	Czas t_2+t_3	Falling parts	Ignition of the cotton wool indicator	Burning up to the handle
	s	*s*	*s*	*s*			
1	>60				not	not	yes
2	>60				not	not	yes
3	>60				not	not	yes
4	>60				not	not	yes
5	>60				not	not	yes
Total burning time ti: >300+1 s							

t - first residual flame time, t - second residual flame time,
Ê - residual glow time, after the second flame-out, t' - total burning time.

Based on the test results obtained in accordance with para. 9.4. of EN 60695-11-10:2014, the tested material cannot be classified in any flammability category.

Table 7. Fire hazard test result - method B - set II, sample designation LT/399/19/1/11--20

Number tests	Cz¥S t+	Time t2	This time	Time tz t3	Falling parts	Ignition of the cotton wool indicator	Burning up to the handle
1	>60				not	not	yes
2	>60				not	not	yes
3	>60				not	not	ye s
4	>60				not	not	yes
5	>60				not	not	yes
Total burning time ti: >300 -1 s							

I, - first residual flame time, t, - second residual flame time,

Ê - residual glow time, after the second flame-out, I, - total
pJoni9on time.

Based on the test results obtained in accordance with para. 9.4. of EN 60695-11-10:2014, the tested material cannot be classified in any flammability category.

Table 8. Fire hazard test result - method B - set III, sample designation LT/399/ź 9/2/a --10

Number **póby**	Time t,	Time t,	Time t3	Time t2'$_{t}$^	Falling parts	Ignition of the cotton wool indicator	Burning up to the handle
1	>60				not	not	yes
2	>60				not	not	yes
3	>60				not	not	yes
4	>60				not	not	yes
5	>60				not	not	yes
Total burning time ti: >300¿1 s							

Estimation of measurement uncertainty with a confidence level of 95% and a coverage factor of k=2

t' - first residual flame time, tx - second
residual flame time,
Ê - residual glow time, after the second flame-out, fi - total burning
time.

Based on the test results obtained in accordance with para. 9.4. of EN 60695-11-10:2014, the tested material cannot be classified in any flammability category.

Table 9. Fire hazard test result - method B - set IV, sample designation L7/399/J 9/2/a -20

Number tests	Time t1	Time t2	These times	Time $_{tz+t}$^	Falling parts	Ignition of the cotton wool indicator	Burning up to the handle
	s	*s*	*y*	*s*			
1	>60				not	not	yes
2	>60				not	not	yes
3	>60				not	not	yes
4	>60				not	not	ye s
5	>60				not	not	yes
Total burning time of t\: >300¿1 s							

Estimation of the uncertainty of the measurement result with a confidence level of 95% and coverage factor k=2

I - first residual flame time, t, - second
residual flame time,
t - residual glow time, after the second flame-out, t' - total burning
time.

Based on the test results obtained in accordance with para. 9.4. of EN 60695-11-10:2014, the tested material cannot be classified in any flammability category.

Estimation of the uncertainty of the measurement result at a confidence level of 95% with coverage factor k=2

6. Date of acceptance of object for study:

17.10.2019 r.

Compiler of the r e p o r t

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