

1. Infrared Spectroscopy (FTIR-ATR)

FTIR measurements were carried out using a Fourier Transform IR spectrophotometer (Jasco 4200 Type A). The FTIR spectra, in the wavenumber range from 400 to 4000 cm^{-1} and resolution 4 cm^{-1} , were obtained by the KBr pellet technique. The pellets were prepared by pressing a mixture of the sample and dried KBr (sample: KBr approximately 1:200) at 7.5 t/cm^2 . The evaluation of FTIR spectra was carried out by the use of Jasco Spectra Manager™ Suite software. The Figure 4 shows Jasco 4200 Type A spectrophotometer.



Jasco 4200 Type A FTIR spectrophotometer

2. TGA

Thermo gravimetric analysis was conducted on a Q500 equipment provided by TA Instruments (Cerdanyola del Vallès, Spain) to determine the thermal resistance of those samples as well as to quantify the presence of any other inorganic components such as fillers or pigments. While for PE and PET samples, the test was performed at constant rate of 10 K/min between 30 and 1000°C, switching gas to oxygen at 800°C, the PVC condition are summarized in the table below:

Table 1 TGA test conditions for plasticized PVC samples

Temperature range (°C)	Heating rate (°C/min)	Gas
30-170	20	N ₂
170-400	5	N ₂
400-800	10	N ₂
800-1000	10	Air

These samples were tested in that conditions in order to gain resolution of the plasticizer degradation when incorporated in the PVC and thus quantify the plasticizer incorporation effectiveness.

3. DSC

A differential scanning calorimetry was performed on a Q20 calorimeter produced by TA instruments (Cerdanyola del Vallès, Spain) in order to characterize the thermal transitions and crystallinity of the analyzed materials. All samples were heated twice to erase the thermal memory during the first heating. The test conditions are shown in

Table 2.

Table 2 Test conditions for the different materials

Material	T _{max} (°C)	T _{min} (°C)	Heating/cooling rate (°C/min)
HDPE	220	30	10
PET	300	60	10
PVC-P	110	-90	10
PVC-U	200	30	10

4. MVR

The melt volume rate was measured according to ISO 1133 using an MI-3 Melt Indexer equipment provided by Göttfert. The MVR was only determined for the PE and PVC materials. The set temperature for measuring both samples' MVR was 190°C. For measuring the MVR of the PE from the second lot was necessary to increase the testing weight up to 5 kg for obtaining a measure. This was not necessary in the case of the third lot PE, which was able to measure at 2.16kg, the standard weight condition. For rigid PVC, a weight of 21.6 kg was used for MVR determination; whereas, plasticized PVC was conducted with both 21.6 and 5 kg.

5. Crosslinked content determination

A soxhlet extraction with xylene (isomer mixture) was carried out during 72 h in order to quantify the crosslinked content of the polyethylene sample. Afterwards, the not-solved sample was weight and thus XLPE content was quantified.

6. Scanning electron microscopy



Morphological characterization of wood and polyethylene fibres has been assessed before and after the surface treatments by electronic microscope that images the sample surface by scanning it with a high-energy beam of electrons in a raster scan pattern. The equipment used for this purpose has been JSM-6010-LV model (from JEOL). The samples have been previously coated by a gold layer (to make them conductive) using the equipment Cressington Sputter Coater 108 auto.

7. Ageing determination

Paint samples were tested to evaluate aging. Test equipment used was 1- Artificial light aging chamber, ATLAS SUNTEST XX and 2- Light booth, GRETAGMACBETH SPECTRALIGHT III. The scope of this test is to expose specimens to xenon-arc light in the presence of moisture to reproduce the weathering effects that occur when materials are exposed in actual end-use environments in daylight or daylight filtered through window glass. Parameters of this test are:

- Continuous irradiation
- Irradiance (300 - 400) nm: $60 \text{ W/m}^2 \pm 2 \text{ W/m}^2$
- Filters: Daylight
- BST (Black Standard Thermometer) temperature: $65^\circ\text{C} \pm 3^\circ\text{C}$ (dry period)
- CHT (Chamber temperature): $38^\circ\text{C} \pm 3^\circ\text{C}$ (dry period)
- Relative humidity: $50\% \pm 10\%$
- Exposure period:
 - o 102 min dry
 - o 18 min water spray

Total exposure done: 500 h

	Artificial light aging chamber	ATLAS SUNTEST XXL+
	Light booth	GRETAGMACBETH SPECTRALIGHT III