

Identification of fishing gear materials

The synthetic fibre groups have well-defined characteristics which help us to distinguish it from other groups. These characteristics determine the suitability of a fibre for a particular fishing gear. The fisherman should be aware of the chemical group his net material belongs. Unfortunately it is very difficult to differentiate various kinds of synthetic fibres. There are less visual differences between the various kinds of synthetic fibres than there are in vegetable fibres and synthetic netting material can therefore rarely be determined by its appearance alone. If you know the trade name it is possible to find out the chemical group from trade-name lists. If this is not the case, several methods of identification may be applied. In the following, only those are considered which can be carried out easily and without elaborate techniques and apparatuses (with the exception of the determination of the melting point.). This excludes for practical reasons more elaborate methods which require expensive equipment and specific expertise such as microscopic examination and micro-photographs, staining with special dyes or reagents, determination of fibre density, as well as infrared spectroscopy gas chromatography and differential thermal analysis.

Finishing agents (pigments, colours, delustring and stabilizing agents adhesive substances, oil, starch, resin) used for dyeing stiffening and stabilizing the netting yarn, the netting, or its knots, may change the test results to be expected from raw and unfinished materials. They should therefore be removed from the specimen by a suitable simple treatment, taking appropriate care that the fibres are not unduly damaged. For instance, boiling in distilled water will often be sufficient.

	PA 6.6 and PA 6	PES	PE	PP	PVC	Saran	PVA(A)
In flame	Melts and then burns with light flame. White smoke, Drops of yellowish melting drip down	Melts and burns with light flame. Sooty, blackish smoke, drops of melting drip down.	Shrinks, curls, melts and burns with light flame. Drops of melting drop down	Shrinks, melts and burns with light flame, drops of melting drip down	Shrinks rapidly and melts does not burn, sooty, melts into a crumbling, black substance	Melts and burns with light flame.	Shrinks, curls and burns very rapidly with light flame.
After leaving flame	Stops burning if melting drops fall down. Small bead on the end of the sample. Hot melting bead	Stops burning if melting drops fall down. Small black bead on the end of the	Continues to burn rapidly. Hot melting substance cannot be stretched	Continues to burn rapidly. Hot melting substance may be stretched	Hot melting substance cannot be stretched.	Stops burning immediately. Hot melting substance may be stretched into fine thread	Continues to burn rapidly. Melting substance cannot be stretched

	may be stretched into fine thread	sample. Hot melting bead may be stretched into fine thread		into fine thread			
Residue	Hard, round, yellowish bead; not crushable	Hard blackish bead; not crushable	No melting bead; like paraffin; crushable	Hard, round brown to blackish; not crushable	Hard, blackish, crumbly irregular; no bead	Porous, blackish irregular substance; crushable; no bead	Hard, brown to black, irregular; not crushable
Smell of the smoke	Celery-like; fishy odour; faintly like pyridine.	Oily, soot odour; faintly sweet; similar to scaling-wax; aromatic	Similar to burning asphalt; like wax or paraffin	Similar to burning asphalt; like wax or paraffin.	Sharp, sweet; sweetish-sourish	Sharp, acrid	Sharp, sweet like chlorine.

Water test

This is the first step in the identification of a method. A small piece of netting yarn is put into a vessel filled with water after tying a simple overhand knot. Air bubbles in the material must be squeezed out by hand under water. Preferably a wetting agent (e.g. 1g 1 Lissapol N or Nekal BX) should be added to the water. The water test serves to classify the netting material in to two groups. i.e. those synthetic fibres which float in water (PE and PP) and those which sink (all other kinds of synthetic fibres)

Visual inspection

The preliminary identification of the material is possible by observing the types of fibres used for the construction and appearance of the netting yarn used. The type of single yarn used for the construction, whether it is shiny or soft, smooth or hard will give an idea about the material used. For example PE is not produced as continuous filament and staple fibres. Similarly PP is produced only as split fibres for fishing nets.

Burning test

The changes in the material when it is nearer the flame and after removal from the flame are noted. For this test only a clean flame and two forceps are needed. The best source of flame is a Bunsen burner. Alternatively alcohol lamp or even a cigarette lighter can be used. A piece of netting material is brought near the flame and then removed. The melting and burning patterns and the nature of the residue produced if any are observed. In the early days of the introduction of synthetic fibres into fishing the burning test was very often used by fishermen as it is the simplest test for distinguishing synthetic fibres from cotton. Vegetable fibres and most of the man-made fibres made of regenerated cellulose burn rapidly in the flame and continue burning after removed from the flame. They have an afterglow, the smell of smoke is similar to that of burning paper and the residue consists of a small amount of fine ash. The synthetic fibres being thermoplastic shrink and melt in the flame; the melting substance drips from the flame, mostly forming a bead or a hard irregular residue.

Table shows the reactions to the burning test of the different synthetic fibres by which they can be identified. However, in practice the differences are not always so clear as shown in the table. For an accurate identification it is necessary to verify the results of the burning test by the solubility test and/or the melting point test.

Solubility test

This relatively simple chemical test does not require any particular skill in chemistry, or any equipment or complicated equipment. Safety precautions common for chemical laboratories should be observed, especially when working with boiling reagents. The requirement for the test are 25 ml test tubes, a heat source (e.g. Bunsen burner or alcohol lamp) a holder to hold the test tube into the flame, and the chemical reagents quoted in the table. If an electric hot plate is used instead of test tubes, glass beakers of 50 to 100 ml in size and glass stirring rods are used.

The fibres of the sample to be tested should be loose as possible. Therefore, the netting yarn is untwisted and the fibres are cut in to pieces of about 1cm in length. Coarse material, like split fibres, and monofilaments, should be reduced to very small pieces. Small samples of the material and 10 to 15 ml of the solvent should be put into the test tube. Further directions for the application of the solubility test may be taken from Table. The reagents quoted have been selected so that only one reaction needs to be observed i.e soluble or not soluble.

In most cases it will not be necessary to conduct the test with all reagents given in Table

- Polyamide (PA) fibres are soluble in the reagents (a) and (e). If it is desirable to separate the two types from one another, (c) can be used, it which PA 6 is soluble but not PA 6.6
- Polyester (PES) fibres are not soluble in (a),(f) and (g).
- Polyethylene (PE) and polypropylene (PP) fibres are not soluble in (b) and (c).
- Polyvinyl chloride (PVC) (not after-chlorinated; see note(3) in table 2 is the only synthetic fibre here mentioned which is soluble in reagent (g) at room temperature.
- Saran (PVD) may be identified by its solubility in (f) and (c).
- Polyvinyl alcohol (PVAA) (after – treated with formaldehyde; see note (4) in Table 2) is soluble in (a) but not in (e).
- PE and PP cannot be distinguished from one another by a solubility test. The burning test (Table) shows some differences in the reactions of these two synthetics but it is not always sufficient for identification. The most reliable method to distinguish PE from PP is to determine the melting point.

Table-identification of synthetic fibres by solubility tests

Reagent\kind of fibre	PA 6.6	PA 6	PES	PE	PP	PVC	Saran	PVA (A)
(a) Hydrochloric acid/HCL (37%) 30 minutes at room temperature	+	+	O	O	O	O	O	+
(b) Sulphuric acid/H ₂ SO ₄ (97-98%) 30 minutes at room temperature	+	+	+	O	O	O	(+)	+
(c)Dimethylfomamide/HCON(CH ₃)(1)O 5 minutes boiling	O	+	+	O(2)	O(2)	+(3)	+	O
(d) Formic acid/HCOOH(96-100%)	+	+	O	O	O	O	O	+

30 minutes at room temperature								
(e) Glacial acetic acid/CH ₃ -COOH 5 minutes boiling	+	+	O	O	O	O	O	O
(f) Xylene/C ₆ H ₄ (CH ₃) ₂ 5 minutes boiling(inflammable!)	O	O	O	+	+	O(2)	+	O
(g) Pyridine 30 minutes at room temperature	O	O	O	O	O	+	(+)	O

+ = soluble O = not soluble; (+) = soluble only if boiled, but not at room temperature.

(1) Dimethylformamide is decomposed by exposure to light even when store in a brown bottle. It should be stored away from light and preferably in a cool place. (2) Destroyed but not soluble. (3) Soluble already at room temperature.

Melting point test

The melting points of the thermoplastic synthetic fibres are significantly different. The determination of the melting point of an unknown net material is, therefore, a very reliable identification method. Unfortunately the equipment needed is not quite simple, although the actual test with suitable equipment is easy to perform. The melting point test is mentioned here, mainly because it enables one in relatively simple manner to determine type of material.