MICROPOL

MICROLINK XL

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Crosslinkable polyethylene is a material that is produced from standard polyethylene by a chemical process which allows the moulder to produce, on conventional rotational moulding equipment, finished products with much improved performance properties.

INTRODUCTION

Conventional and linear polyethylenes have a wide range of excellent properties and they are both readily processed by rotational moulding. Both these types of polyethylene are made up of long polymeric chains that are closely entangled in a complex structure. The state of this structure forms the basis of the performance properties of articles made from each particular grade or type of polyethylene. Polyethylene always remains thermoplastic, which means that the application of heat will cause the polymer chains to move and the entangled chain structure to become distorted. Melting or softening occurs and the finished product becomes unusable. Other aggressive environments such as impact loads, aggressive chemicals, low temperatures and environmental stresses cause the entanglement of the polymer chains to change leading to destruction of the polymeric structure.

Creation of links between the polymer chains prevents movement of the chains in relation to one and another thus forming a more stable polymeric structure.

The process of making crosslinkable polyethylene involves firstly the formation of sites on the polymer chains where links can be initiated. The second stage of the process is the development of strong, permanent three dimensional links between the chains. The final result is a more rigid and stable polymeric structure within the finished moulding that will have enhanced resistance to a wide range of aggressive environments or rigorous service conditions that would destroy conventional or linear polyethylenes.

Micropol have been producing crosslinkable polyethylene for extrusion for more than 25 years. We have also been producing colour compounded rotational moulding powders for 40 years. Our extensive experience of these technologies has been combined to produce a unique range of colour compounded crosslinkable powders for rotational moulding.

PROCESSING AND TESTING

Microlink XL is rotationally moulded by methods largely similar to those used in processing conventional and linear polyethylene.

MOULD CONSTRUCTION

Steel and aluminium moulds are both suitable. Moulds should not have porous interior surfaces and must be well vented to relieve the pressure build up generated during the heating cycle. Particular attention should be paid to the design and use of the vent tube to ensure that it does not become clogged with powder or molten polymer.

PROCESSING CONDITIONS

As with other polyethylenes, processing conditions will vary according to the machinery used (particularly the oven design and control) and the moulding being produced.

As a general rule processing temperatures of between 270°C and 300°C have been found suitable. Heating time is of the order of 4 minutes per millimetre of wall thickness.

In order to complete the crosslinking reaction which occurs during the heating cycle, sufficient heating time has to be allowed. As the moulding temperature is raised the chemical crosslinking will proceed more rapidly, and a shorter heating cycle may be possible. Satisfactory mouldings may thus be made at various combinations of moulding temperature and time, these two parameters being linked together.

TESTING DEGREE OF CROSSLINKING

In order to assess whether the selected combination of heating time and temperature is sufficient to have completed the crosslinking reaction, certain tests can be carried out. These will give a useful indication of the degree of crosslinking achieved. Test failure usually

means that heating time or temperature needs to be increased.

BENT STRIP TEST

A narrow strip (10-20mm wide) is cut from the part or trim and bent so that the inside surface is on the outside of the bend. Appreciable surface crazing with cracks going into the wall interior indicates that the part is not completely crosslinked.

FALLING WEIGHT IMPACT TEST

In this test a 4.5 kg weight metal dart having a hemi-spherical striker is dropped from a predetermined height on to a 150mm square sample cut from the moulding. The sample is cooled before testing to -20°C. Insufficient crosslinking results in brittle failure in the test piece. This test is based on one devised by "The Association of Rotational Moulders". Full details can be obtained from Micropol.

GEL CONTENT BY EXTRACTION

In this test the non crosslinked fraction of the part is dissolved in boiling xylene under reflux. The remainder is dried and weighed and the actual crosslinking percentage determined. Micropol Technical Service Laboratory is fully equipped to carry out this and other tests on behalf of customers and can also advise on the exact test methods.

DENSITY

Uncrosslinked XL28 has a density of 0.964 g/cm^3. During crosslinking the density becomes lower until the fully crosslinked material has a density of 0.938 g/cm^3. This change in density with crosslinking can be used to assess the extent of the crosslinking reaction.

MICROLINK XL

SAFETY AND HANDLING PRECAUTIONS

Microlink XL contains crosslinking agents (including peroxides) which may cause skin, eye or respiratory irritation during powder handling or thermal processing.

When moulds are being loaded with powder inhalation of dust and contact of dust with the skin should be prevented. Local exhaust systems are recommended in processing areas and the use of a vacuum lance for removing decomposition products prior to mould opening should be considered.

Goggles, gloves and dust masks should be worn when handling powder and a daily change of working clothes is recommended. Following contact with peroxide containing powder particles or decomposition products the eyes should immediately be rinsed and skin carefully cleaned.

PERFORMANCE PROPERTIES

MICROLINK XL has been designed for rotational moulding applications where both exceptional toughness and environmental stress crack resistance is required.

MICROLINK XL has outstanding low temperature impact resistance at temperatures down to -40°C.

MICROLINK XL has very high environmental stress crack resistance to a wide range of chemicals and surfactant agents.

MICROLINK XL is fully stabilised for outdoor use throughout the world.

MICROLINK XL is produced using Micropol's long and intimate experience of the rotational moulding process to give the powder of the right particle size distribution and flow characteristics. This ensures good mouldability and excellent surface finish in the final product.

COLOURED MICROLINK XL

The wide spectrum of colours available in **MICROLINK XL** are all colour compounded. We will colour match your specially required colour using only the most stable and toxicologically acceptable pigments. We have an extensive and increasing range of colour formulations designed to meet customers' increasing demands.

The appearance of mouldings made from compounded **MICROLINK** is the best possible regarding depth, iformity and stability of colour. The standard of all aspects of colour quality is comparable with that achieved with the highest quality of injection moulding processes. The problems of poor pigment dispersions associated with dry colouring are totally overcome by the use of Micropol's high specification colour compounding processes.

The availability of colour compounded **MICROLINK XL** offers the moulder many advantages:-

1. No in-plant colour mixing.
2. No stock holding of a multitude of expensive pigments or pigment packs.
3. No colour variation between mouldings.
4. No mouldings with poor pigment dispersion.
5. No large stock holding of natural powder, nor excessive quantities of coloured powder, just the specific quantity of coloured powder for each order.

The greatest advantage to the moulder is that we carry out the total colour process and deliver to your plant coloured crosslinkable polyethylene powder ready to be loaded into the mould.

NATURAL AND BLACK ARE ALSO AVAILABLE.

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TECHNICAL SPECIFICATION

PHYSICAL PROPERTY:

	ASTM TEST METHOD	UNIT	VALUE
DENSITY	D1505	g/cm^3	0.938
ESCR (F50)	D1693	Hours	>1000
ULTIMATE TENSILE STRENGTH (50mm/min)	D638	MPa	23
ELONGATION AT BREAK	D638	%	350
VICAT SOFTENING TEMPERATURE	D1525	°C	127
BRITTLENESS TEMPERATURE	D746	°C	<-70
FLEXURAL MODULUS	D790	MPa	750
IMPACT RESISTANCE* AT -20°C	Micropol test based on ASTM D1709	Joules/mm	36

***TYPICAL VALUES FOR LINEAR ROTATIONAL MOULDING GRADES 12-20 Joules/mm**

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