This property can be enhanced by using resins with higher molecular weight, but such resins will generally require more robust equipment and more energy use because they tend to generate higher extrusion pressure during the extrusion process. Therefore, properties must be balanced to provide an acceptable combination of physical properties and processability.

In thick film applications blends of LDPE and LLDPE are used in order to obtain a balance of processability (extruder amps and pressure) and film mechanical properties. In this blend the LDPE component is the processability component whereas the LLDPE is the mechanical end component. Therefore, the ability to decrease the LDPE portion of the blend should increase the mechanical properties of the blend. Through this invention, the ability to increase the melt strength of the LLDPE component allows the use of a higher percentage of LLDPE blend, thus increasing the mechanical properties without sacrificing processability or the creation of unacceptable levels of insoluble material.

The present disclosure provides~~invention is~~ a new process for increasing the melt strength of polyethylene involving reacting molten polyethylene with an alkoxyamine derivative through regular extrusion processing. In an embodiment, there is provided~~Accordingly, one aspect of the invention is~~ a method for increasing the melt strength of a polyethylene resin comprising first selecting a polyethylene resin having a density, as determined according to ASTM D792, in the range of from 0.865 g/cm^3 to 0.962 g/cm^3, and a melt index, as determined according to ASTM D1238 (2.16 kg, 190°C), in the range of from 0.01 g/10min to 100 g/10 min and then reacting an alkoxy amine derivative with the polyethylene resin in an amount and under conditions sufficient to increase the melt strength of the polyethylene resin.

In a first aspect, there is provided a method for increasing the melt strength of a target polyethylene resin comprising the steps of:

a) selecting a target polyethylene resin having a density, as determined according to ASTM D792, in the range of from 0.865 g/cm^3 to 0.970 g/cm^3, and a melt index, as determined according to ASTM D1238 (2.16 kg, 190°C), in the range of from 0.01 g/10min to 100 g/10 min, wherein said target polyethylene resin contains from 0 to less than 1,000 ppm antioxidant additives;

b) reacting an alkoxy amine derivative in an amount less than 900 parts derivative per million parts of total polyethylene resin with the polyethylene resin under conditions sufficient to increase the melt strength of the polyethylene resin.

The present disclosure provides~~invention is~~ a new process for increasing the elongational viscosity of polyethylene involving reacting molten polyethylene with an alkoxyamine derivative through regular extrusion processing. Accordingly, in an embodiment, there is provided~~one aspect of the invention is~~ a method for increasing the melt strength of a polyethylene resin comprising first selecting a polyethylene resin having a density, as determined according to ASTM D792, in the range of from 0.865 g/cm^3 to 0.962 g/cm^3, and a melt index, as determined according to ASTM D1238 (2.16 kg, 190°C), in the range of from 0.01 g/10min to 100 g/10 min and then reacting an alkoxy amine derivative with the polyethylene resin in an amount and under conditions sufficient to increase the elongational viscosity of the polyethylene resin.

The present disclosure provides~~invention is~~ a new process that increases the elongational viscosity at low (0.1 s^{-1}) shear rates while maintaining the viscosity at higher shear rates (> 100 s^{-1}) such that the ease of processing of the material is maintained at typical extrusion conditions. In an embodiment, it is provided~~One aspect of the invention is~~ that the extruder pressure does not increase more than 10% of the comparative resin upon processing the disclosed~~inventive~~ resin at the same operating conditions.

Brief Description of the Drawings:

Figure 1 is a plot of melt strength versus stretching velocity with increasing additive concentration.

Figure 2 is a plot of viscosity versus shear rate with increasing additive concentration.

Figure 3 is a plot of melt strength at the plateau region versus melt index (I_2, g/10 min).

Figure 4 is a plot of phase angle (^{o}) versus the complex modulus (G*) measured using a constant temperature of 190°C at a frequency sweep in a TA Instruments "Advanced Rheometric Expansion System (ARES)"

Figure 5 is a plot of phase angle (^{o}) versus the complex modulus (G*) measured using a constant temperature of 190°C at a frequency sweep in a TA Instruments "Advanced Rheometric Expansion System (ARES)"

Detailed Description of the Invention

In its broadest sense, the present invention is a method for increasing the melt strength of a polyethylene resin. Polyethylene resin includes all polymers or polymer blends which are derived at least 50% by weight from ethylene monomer units. This includes materials known in the art as high density polyethylene (HDPE), linear low density polyethylene (LLDPE), and low density polyethylene made using high pressure reactors (LDPE).

The target polyethylene resin selected should have a density, as determined according to ASTM D792, in the range of from 0.865 g/cm^3 to 0.970 g/cm^3, more preferably from 0.905 g/cm^3 to 0.957 g/cm^3 and a melt index, as determined according to ASTM