SASOL CHEMICALS

A Comparison of Butene comonomer LLDPE and Hexene comonomer hLLDPE

Overview

SASOL AT A GLANCE

Sasol is an international integrated chemicals and energy company that leverages technologies and the expertise of our 30 400 people working in 36 countries. We develop and commercialise technologies, and build and operate world-scale facilities to produce a range of high-value product streams, including liquid fuels, chemicals and low-carbon electricity.

SASOL CHEMICALS

Sasol Chemicals is a producer and marketer of a range of commodity chemicals based on the Fischer Tropsch (FT) and natural gas value chains including chemical feedstocks of ethane, ethylene, propylene and ammonia. Final products include polymers, explosives, fertilisers, mining reagents (caustic soda, sodium cyanide), and a range of alcohols, ketones, acrylate monomers, and other oxygenated solvents.

Final products marketed through the Polymers division include low density polyethylene (LDPE), hexene linear low density polyethylene (hLLDPE), polypropylene (PP), and polyvinyl chloride (PVC) as well as propylene and ethylene monomers. Through this product portfolio we offer polymer solutions for a broad range of applications and industries.

Our polymers are marketed throughout Sub-Saharan Africa, Europe, Americas and Asia and we are active in over 75 countries globally.

Our Polymer Technology Services Centre in Johannesburg provides expertise and technical service support to external customers and also undertakes polymer-related applications research and development applicable to the Polymers division.

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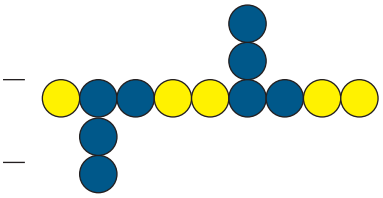
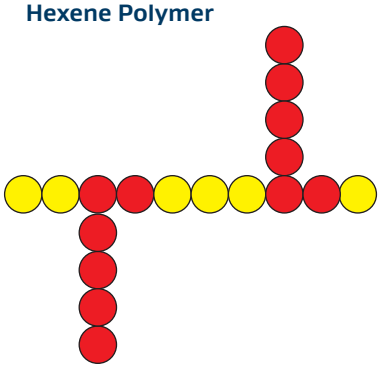
1. INTRODUCTION

Linear Low Density Polyethylene (hLLDPE) can be produced with different comonomers, such as butene or hexene. Sasol Base Chemicals uses hexene for its hLLDPE grades, which gives certain property improvements to the hLLDPE produced, mostly as a result of the increased branch length from using the hexene.

Butene Polymer



Hexene Polymer



2. MECHANICAL PROPERTIES

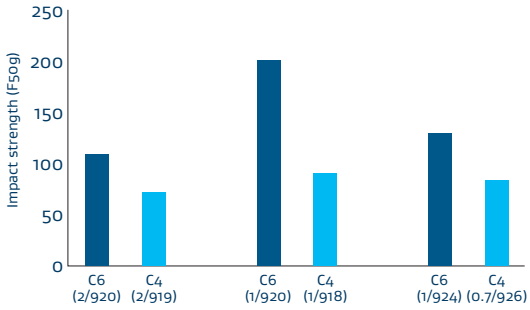
It has been found that for hLLDPE polymers of similar MFI and density:

- Impact strength: up to 30% higher for hexene hLLDPE
- Machine direction Tear Strength: up to 100% higher for hexene hLLDPE
- Transverse direction tear strength: up to 30% higher for hexene hLLDPE

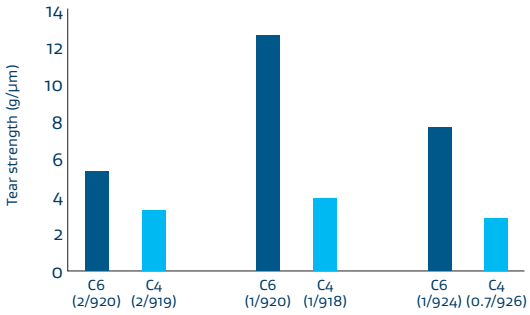
The densities of some of the grades were increased which will give film with a higher stiffness and less creep.

The graphs below show this improvement in mechanical properties for certain of the Sasol Polymers hexene grades compared to the previous butene grades.

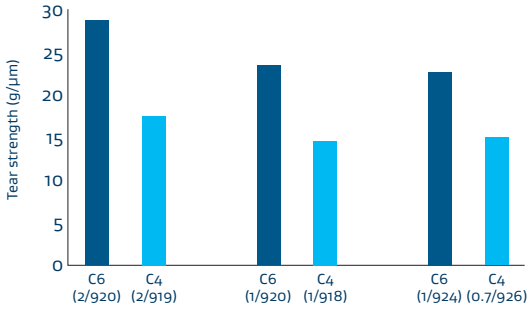
Comparison of Impact Strength of C6 and C4 hLLDPE grades



Comparison of the Machine Direction tear strength of C6 and C4 hLLDPE grades



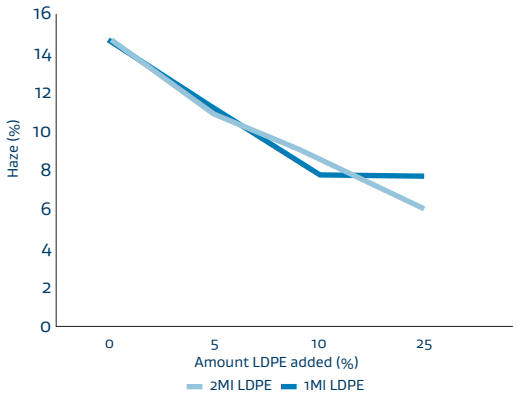
Comparison of the Transverse Direction tear of C6 and C4 hLLDPE grades



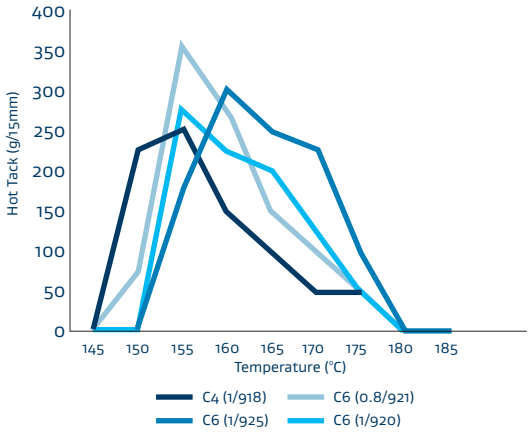
3. OPTICAL PROPERTIES

It has been found that generally the optical properties of hexene hLLDPE grades are slightly inferior compared to butene LDPE grades, partly as a result of the higher density of the polymer. However, given that most converters blend LDPE into hLLDPE to improve bubble stability, this will dramatically improve the optical properties of the film. The graph below shows the benefical effect of blending a small amount of LDPE into hexene hLLDPE.

Effect of blending LDPE into C6 hLLDPE



Comparison of the Hot Tack of C4 & C6 hLLDPE Resins



4. SEALING PROPERTIES

Whilst the heat seal strength of hexene hLLDPE is comparable to that of butene hLLDPE, the hot tack is up to 25% higher, which will assist in form, fill and seal operations. The hot tack of different hexene hLLDPE resins compared to butene hLLDPE is given above. Data was measured on 50µm film.

5. APPLICATIONS

There are numerous film applications, but there are some where the increased strength of the hexene hLLDPE is an advantage. These include: stretch film (cast and blown), mulch film, heavy duty sacks – indeed any film where strength is a requirement. The increased mechanical properties allow for the possibility of downguaging a film.