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innovative solutions

DEUREX®
T-Line Olefins

efficient & sustainable application for the industry

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Introduction

Flexilis GmbH was founded in 2020 with the current regulatory, environmental and technical requirements of the industry in mind. The return of raw material production to Europe providing short and plannable supply routes, taking into account all ecological regulations, is a central theme. A sustainable, reliable supply chain, technical service and customized product modifications reduce transport, storage and production costs as well as CO_2 environmental impact.

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Introduction

T-Line Rheology Improvers:

The latest generation of GTL (gas to liquid) technology olefines produced in the Fischer-Tropsch-Process are applicable as synthetic lubricants. The exact defined linear structure, narrow molecular weight distribution and very low melt viscosity lower the processing temperature of polymers.

The unique combination of physical properties and the ability of Deurex to adapt its melting in a narrow temperature range according to the process request, going along with a high hardness allows quick and safe processes within defined temperature ranges.

The feed stock presently is coal gas derived from coal waste, in near future certified biogas will replace it. This guarantees a local and sustainable production.

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Application in Extrusion

Critical parameter in processing, mainly compounds with high hardness:

- Temperature during form giving process (extrusion, injection molding), up to 130°C
  - higher safety of compounds
  - pressure control
  - viscosity control
  - cooling and more dimensional stability
- In process
  - high energy demand
  - potential risk for damage of extruder head
  - capacity of extruder

Deurex T Line:

- neutral in mechanical properties
- non polar polymers, no or very limited migration
- no degradation
- chain structure is controlled and defined
- clean surface

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DEUREX TR17G, TR19G and TR49G

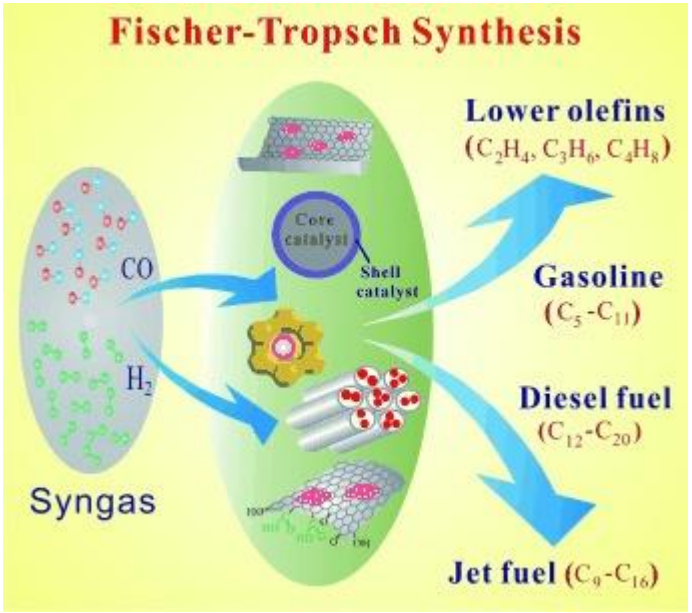
Fischer-Tropsch olefin is mainly composed of straight-chain and saturated high-carbon alkanes with relative molecular weight of 1000. This gives the chemical fine crystal structure, high melting point, narrow melting point range, low oil content, low penetration, low mobility, low melting viscosity, hardness, wear resistance and high stability.

Fischer-Tropsch olefin is saturated with no double bond, strong antioxidant ability and good weather resistance.

The adapted molecular weight goes together with few branched chains and high crystallinity. **It is easy to penetrate into high-viscosity macromolecular chains, which can significantly reduce the melt viscosity.** It has small migration during the processing and obvious “lubrication” effect in the later stage.

Very low viscosity of Fischer-Tropsch olefin in given temperature allows the application as a good internal lubricant to effectively control shear conditions, **promote flow, control friction and melting properties**, thereby improving thermal stability. At the same time, because of its high crystallinity and high linearity structure, Fischer-Tropsch olefin can obtain the best physical and processing properties.

According to the need, **Fischer-Tropsch process can synthesize alkanes with different chain lengths, change the molecular weight of the final product**, and form multiple series of products.



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Application in Extrusion

Recommendation for testing:

- Deurex TR17G, TR19G or TR49G

  - to be added in first mixing step

  - dosage 1-3 phr, additionally to the compound formulation in first trial

- Expectation

  significant drop in pressure on extruder head

  significant drop in temperature total and fluctuation

- Extruded parts

  capacity of extruder can be adapted, either higher output or process parameters

  dimensional stability will improve

  clean surface

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VYSOKÁ ŠKOLA CHEMICKO-TECHNOLOGICKÁ V PRAZE
Fakulta chemické technologie
Ústav polymerů

REPORT

Testing of rubber compound (S-SBR/Silica compound)

Composition

Additive	Compound 1	Compound 2	Compound 3
Deurex TR19 (phr)	---	1	2.4

Mechanical properties

	Compound 1	Compound 2	Compound 3
Hardness, Shore A	92	89	**92**
Tensile strength, rings (MPa)	13.4	16.0	**14.1**
Elongation at break (%)	**173**	**227**	**187**

Mooney viscosity

	Compound 1	Compound 2	Compound 3
100 °C, ML(1+4)	107	94	94

Vulcanisation

	Compound 1	Compound 2	Compound 3
min S (dNm)	18.3	12.0	**13.3**
max S (dNm)	61.1	43.8	**57.0**
T10 (min)	4.1	3.7	**3.7**
T40 (min)	7.3	6.1	**6.2**
T90 (min)	**25.5**	**23.6**	**23.5**

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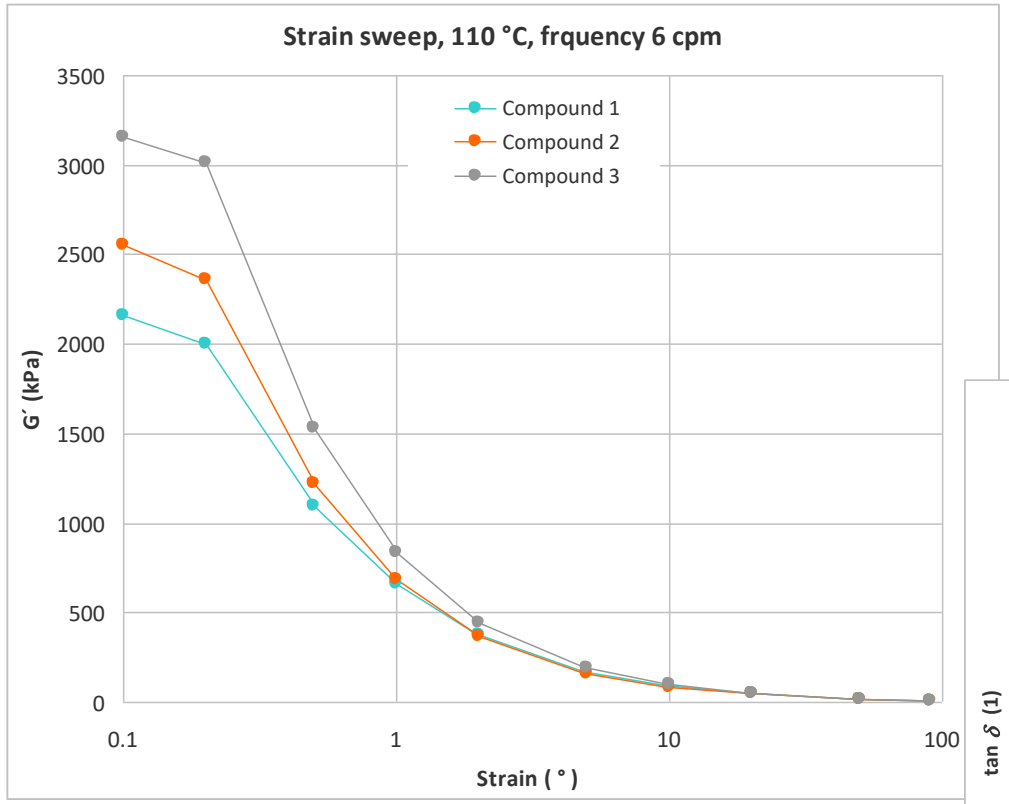

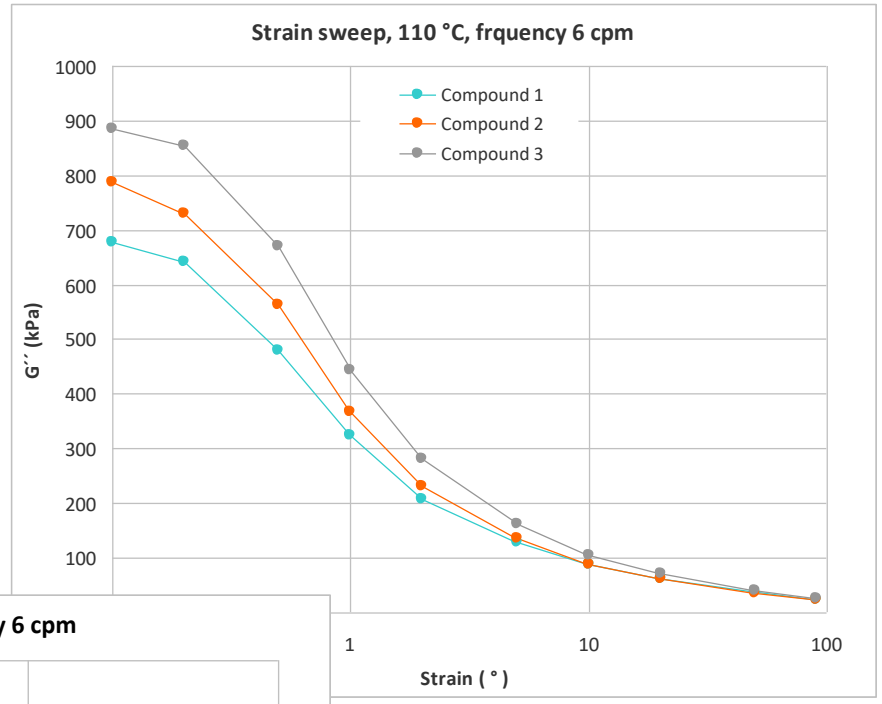

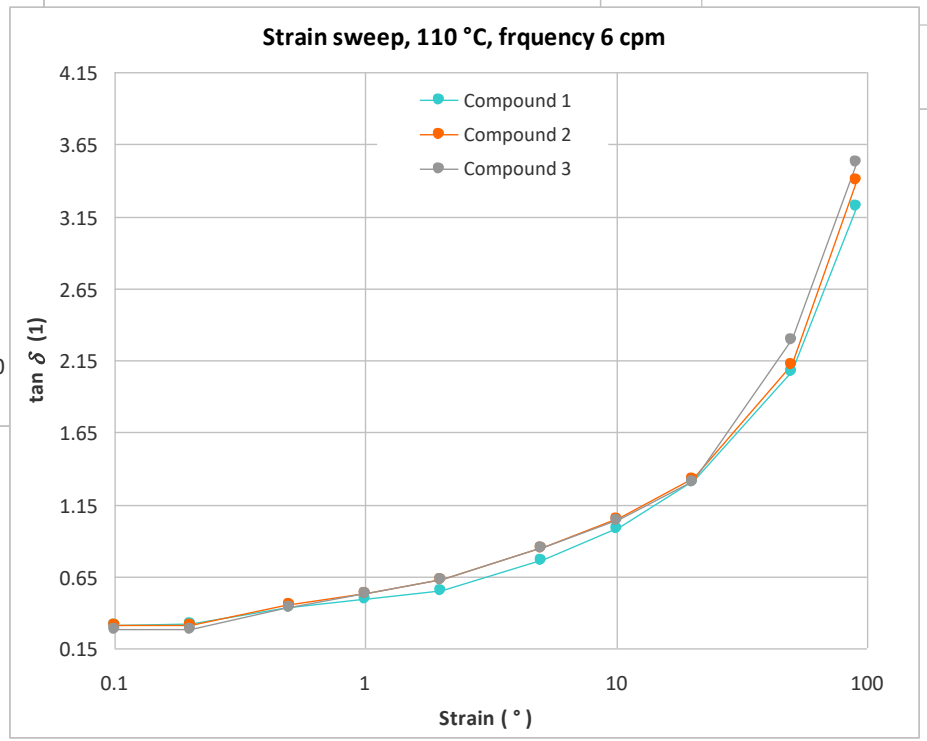

Conclusions

1. Deurex decreases Mooney viscosity at 100°C by 15%

2. During dynamic loading with variable frequency at 110 °C
the Deurex addition increases storage modulus and decreases loss factor tan δ, loss modulus is higher for 1 phr and lower for 2.4 phr.

3. Vulcanization with Deurex additive is slightly faster.

4. The addition of Deurex improved tensile strength and elongation at break of vulcanizates.
The tests confirmed the influence of Deurex TR19 on the rheoligical properties of the tested compounds. We suggest deeper and further evaluation for process analyses such as extrusion.

Prague, 5th December 2022
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member of GREEN PLANET ACT®
INITIATIVE FOR SUSTAINABLE INDUSTRY

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