

MECHANICAL PERFORMANCE AND THERMO-OXIDATIVE AGING OF NATURAL RUBBER BLENDS FILLED WITH RECYCLED THERMOPLASTIC VULCANIZATE

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1. INTRODUCTION

Natural rubber (NR) blends are widely used in engineering applications; however, there is increasing interest in sustainable filler systems. Recycled thermoplastic vulcanizate (rTPV) represents a promising alternative due to its elastomeric behavior and recyclability. This work evaluates the influence of rTPV on the mechanical and thermal properties of NR blends.

2. OBJECTIVE

To investigate the effect of recycled TPV loading on the mechanical performance, thermo-oxidative aging behavior, and thermal stability of NR blends.

3. EXPERIMENTAL

NR blends containing 0–55 phr rTPV were prepared and compared with selected commercial TPVs. Mechanical properties were evaluated before and after thermo-oxidative aging. Thermal behavior was analyzed using TG and DSC measurements.

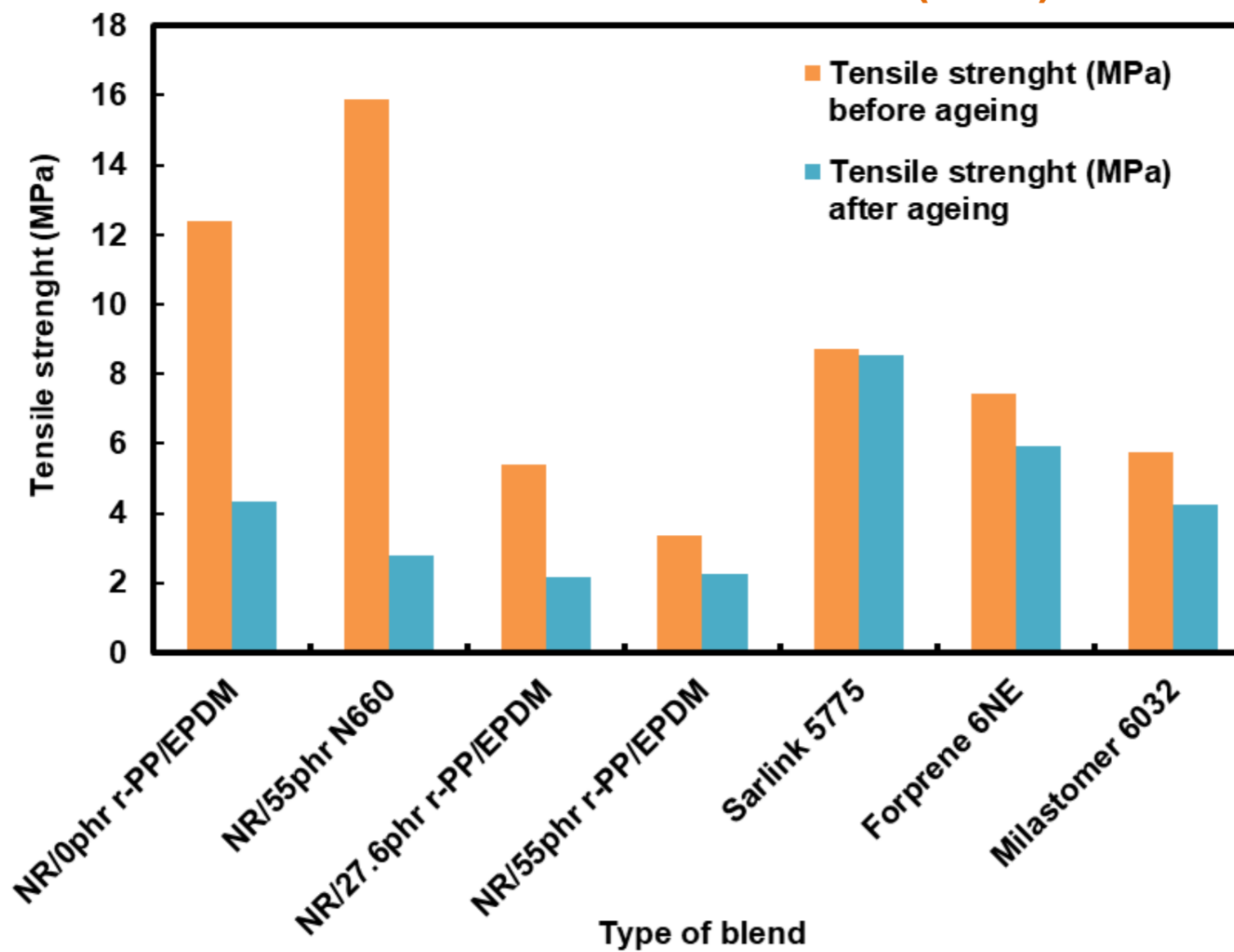
Type of blends

- ♥ NR/0 phr + PP/EPDM
- NR/55 phr N660
- NR/27.6 phr + PP/EPDM
- NR/55 phr + PP/EPDM
- Sarlink ST75
- Forprene 6NE
- Milastomer 6032

4. KEY FINDINGS

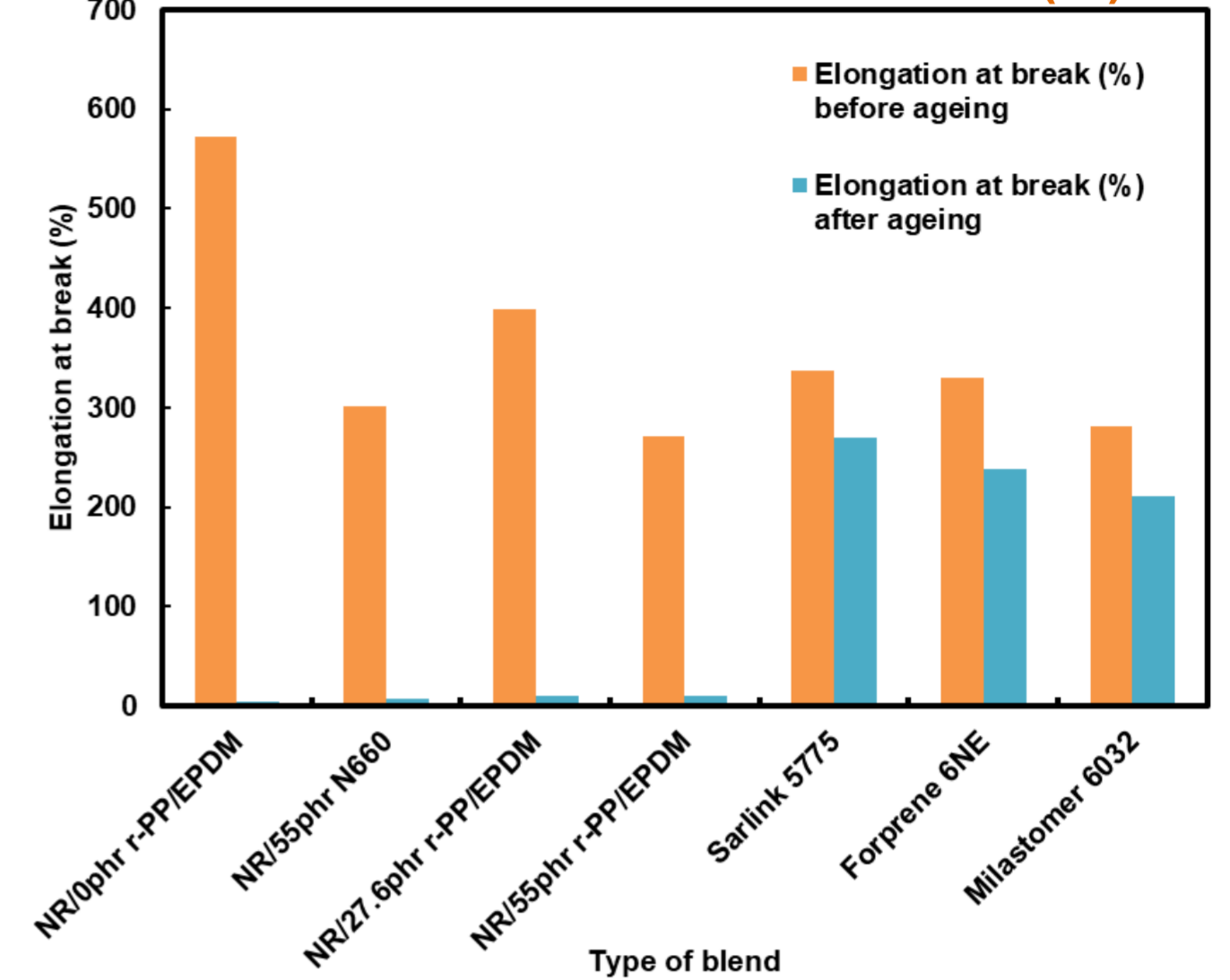
- Increasing rTPV content reduced tensile strength and elongation at break.
- Moderate rTPV loadings maintained mechanical properties comparable to commercial TPVs.
- Thermo-oxidative aging significantly reduced elongation at break.
- rTPV contributed to stable hardness after aging.
- rTPV influenced thermal degradation behavior and thermal transitions of NR blends.

5a. TENSILE STRENGTH (MPa)



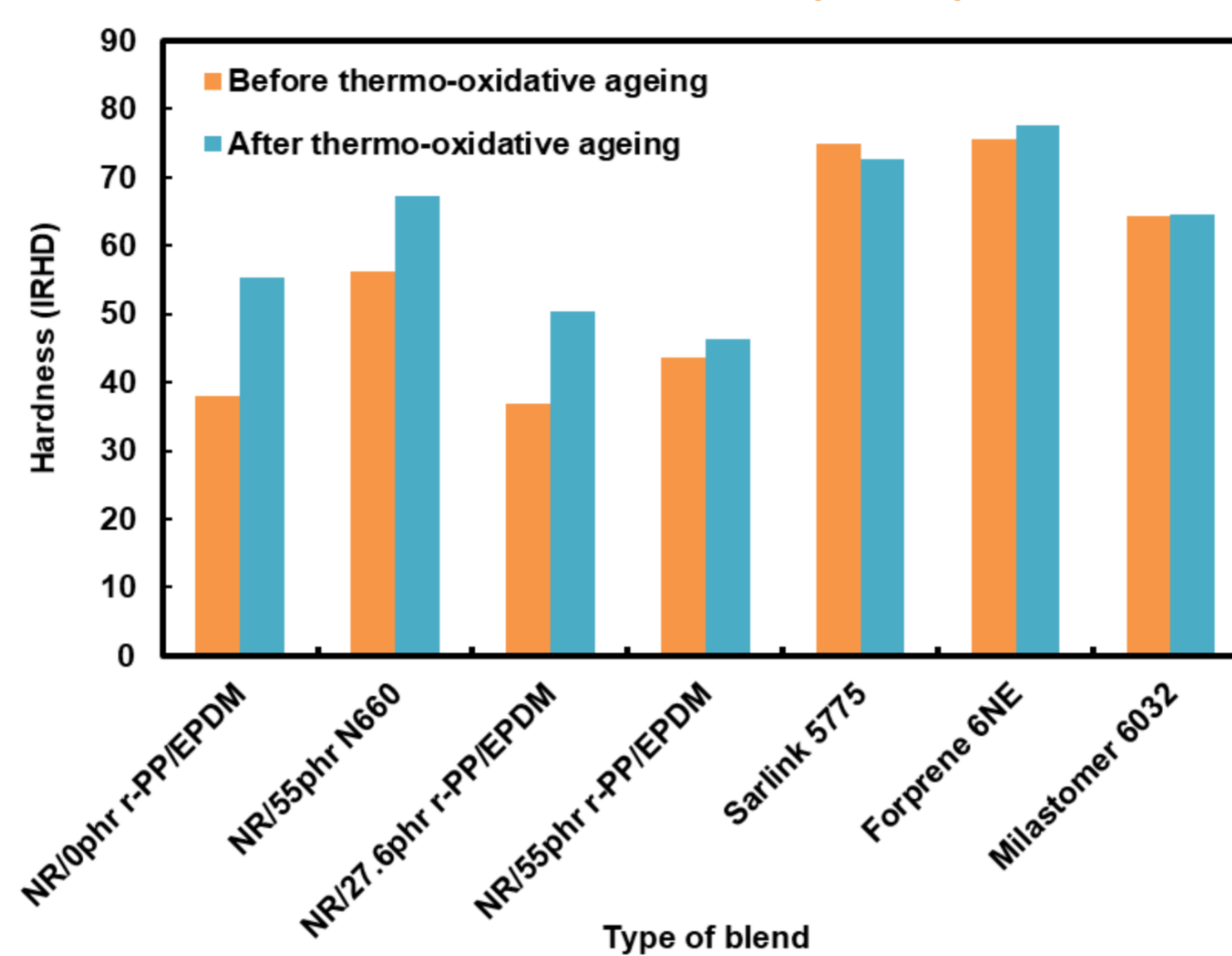
⇒ Increasing rTPV content reduced tensile strength.

5b. ELONGATION AT BREAK (%)



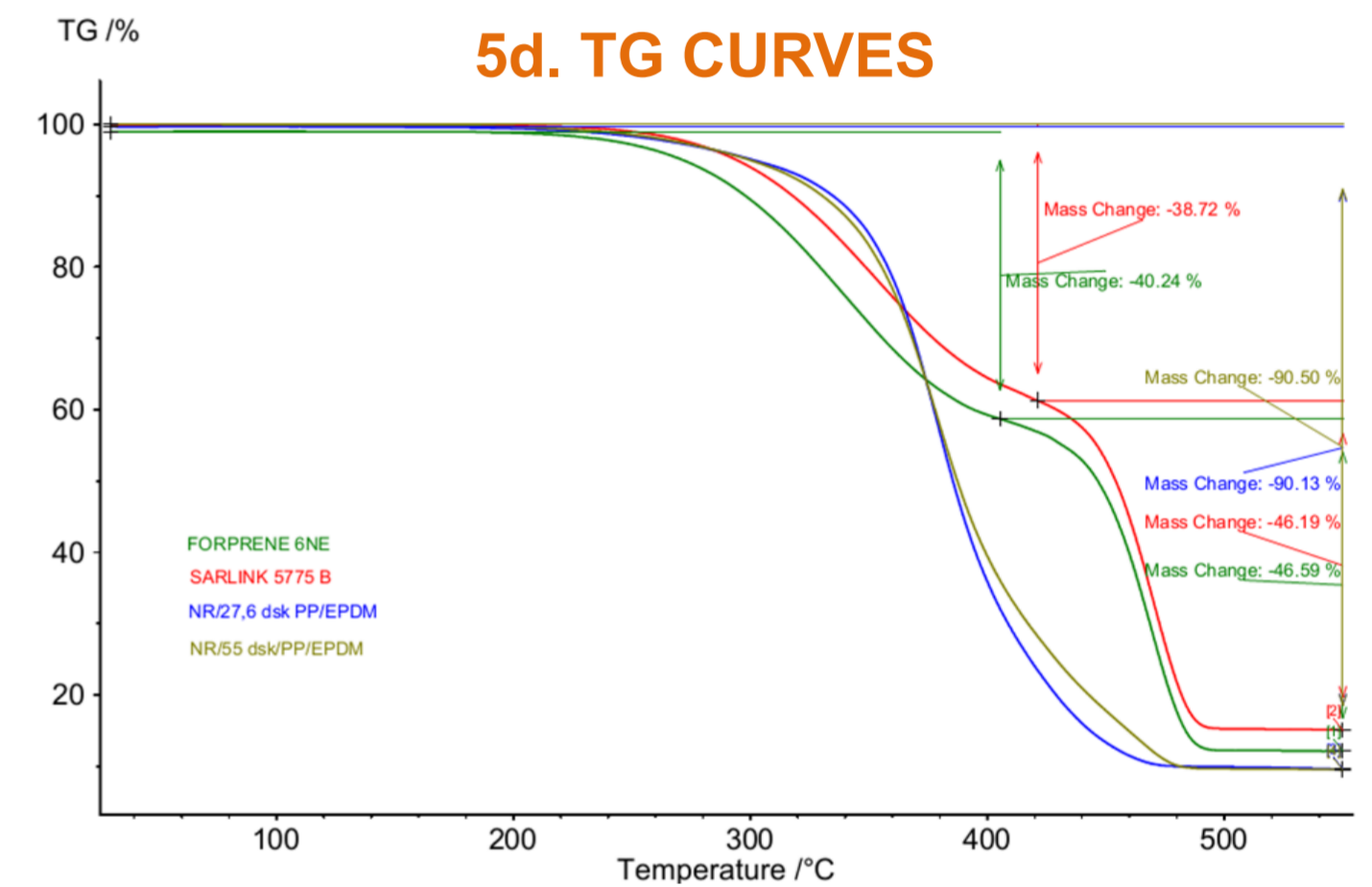
⇒ Aging significantly decreased elongation at break.

5c. HARDNESS (IRHD)



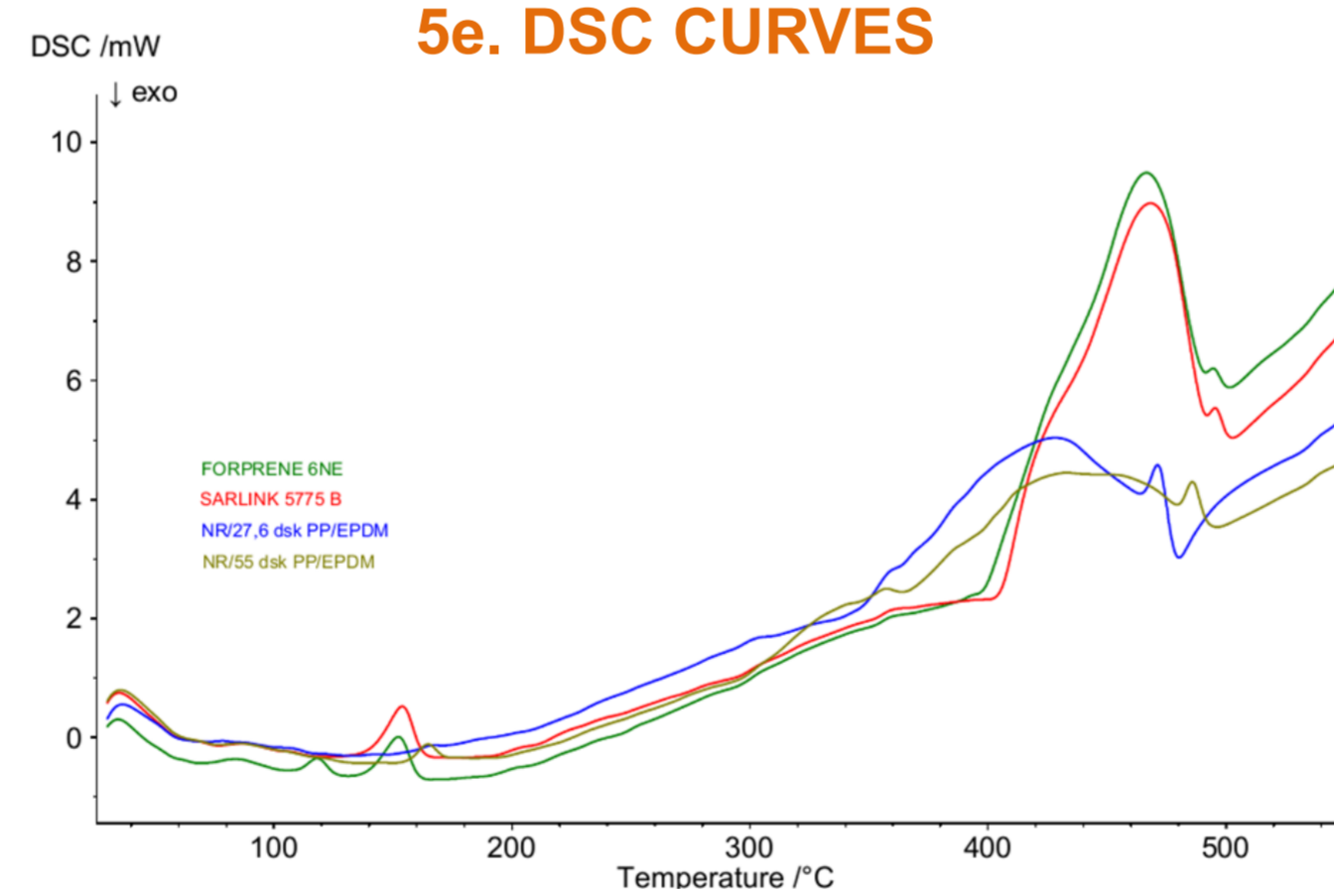
⇒ Hardness increased with rTPV loading and changed only slightly after ageing

5d. TG CURVES



⇒ rTPV influenced thermal degradation behavior (different decomposition temperatures and residues).

5e. DSC CURVES



⇒ Thermal transitions differed between NR/rTPV blends and commercial TPVs.



rTPV provides a sustainable alternative for NR blends while maintaining competitive mechanical performance.

6. CONCLUSIONS



- Increasing rTPV loading reduced tensile strength and elongation at break.
- Moderate rTPV contents-maintained properties comparable to commercial TPVs.
- Thermo-oxidative aging mainly affected elongation behavior.
- rTPV contributed to stable hardness and modified thermal degradation behavior.
- Recycled TPV can serve as a sustainable and cost-effective alternative to commercial TPVs.

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