

# **A Study of Properties of Polyamide/Butyl Rubber Blends**

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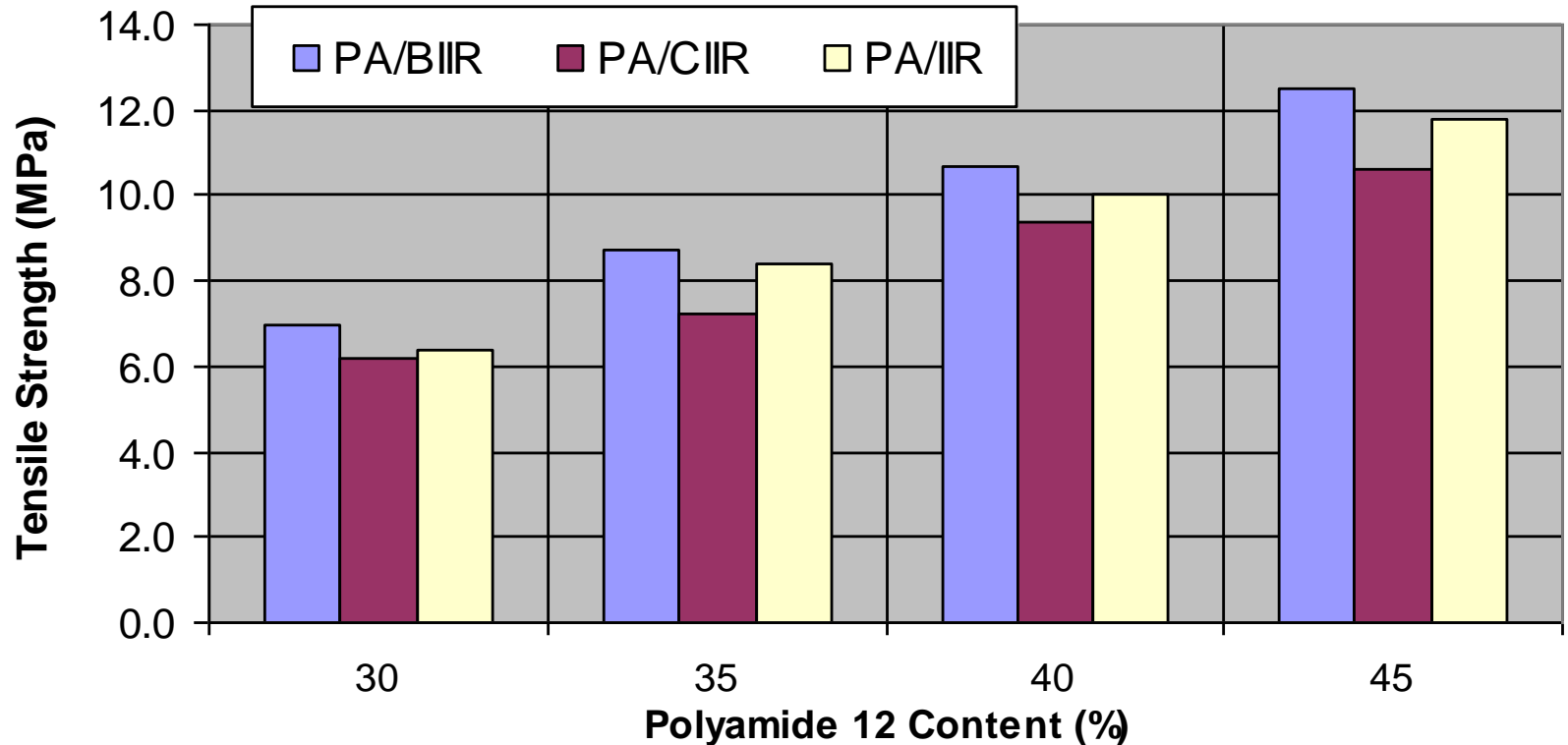
# Blending Possibilities

- Type of butyl rubber (IIR, CIIR, BIIR)
- Proportion in the blend
- Non-vulcanized or dynamically vulcanized
  - Vulcanizing agent (S, ZnO/ZDEDC, MgO/ Amine)
- Type of polyamide
- Blending conditions
- Preparation of the sample

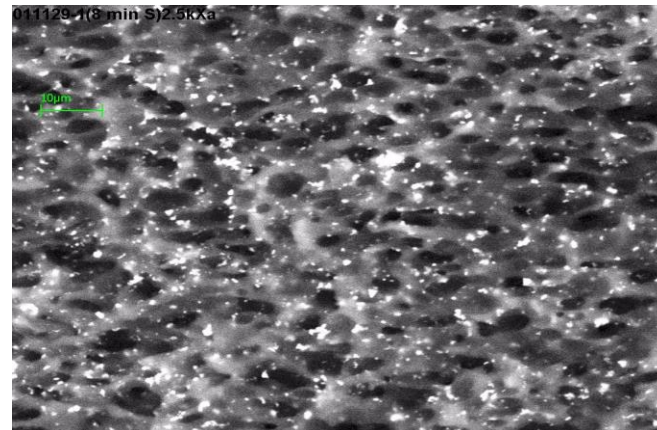
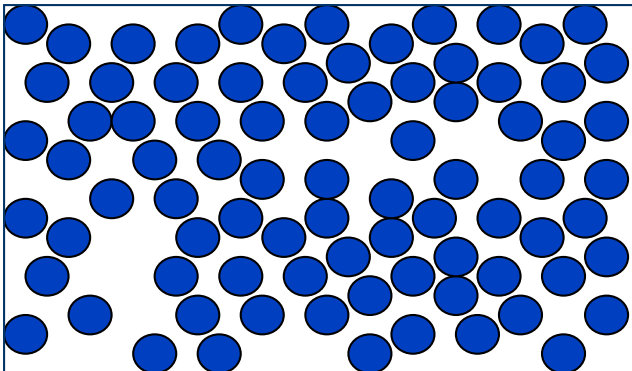
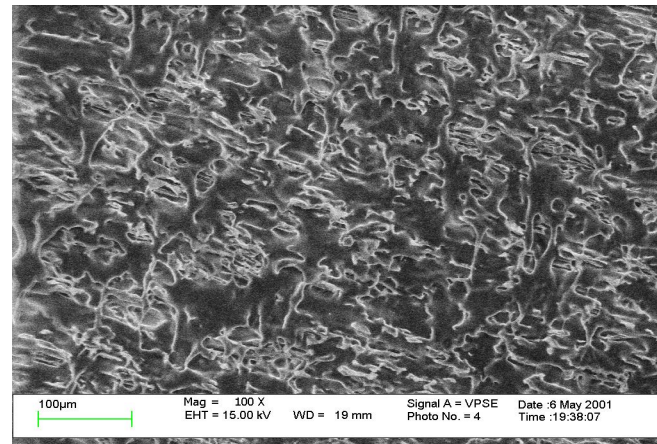
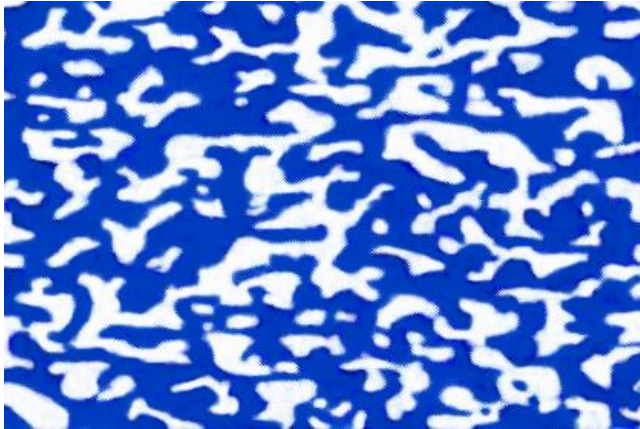
# Polyamide/Butyl Rubber Blends Non-Vulcanized

- Halogenated butyl rubber - more reactive
- Graft/block formation during high speed mixing
  - Halogenated butyl rubber – more graft/block
- Evidence of graft/block in extracted samples
  - Presence of polyamide peak by FTIR
  - Microanalysis indicates excess nitrogen present

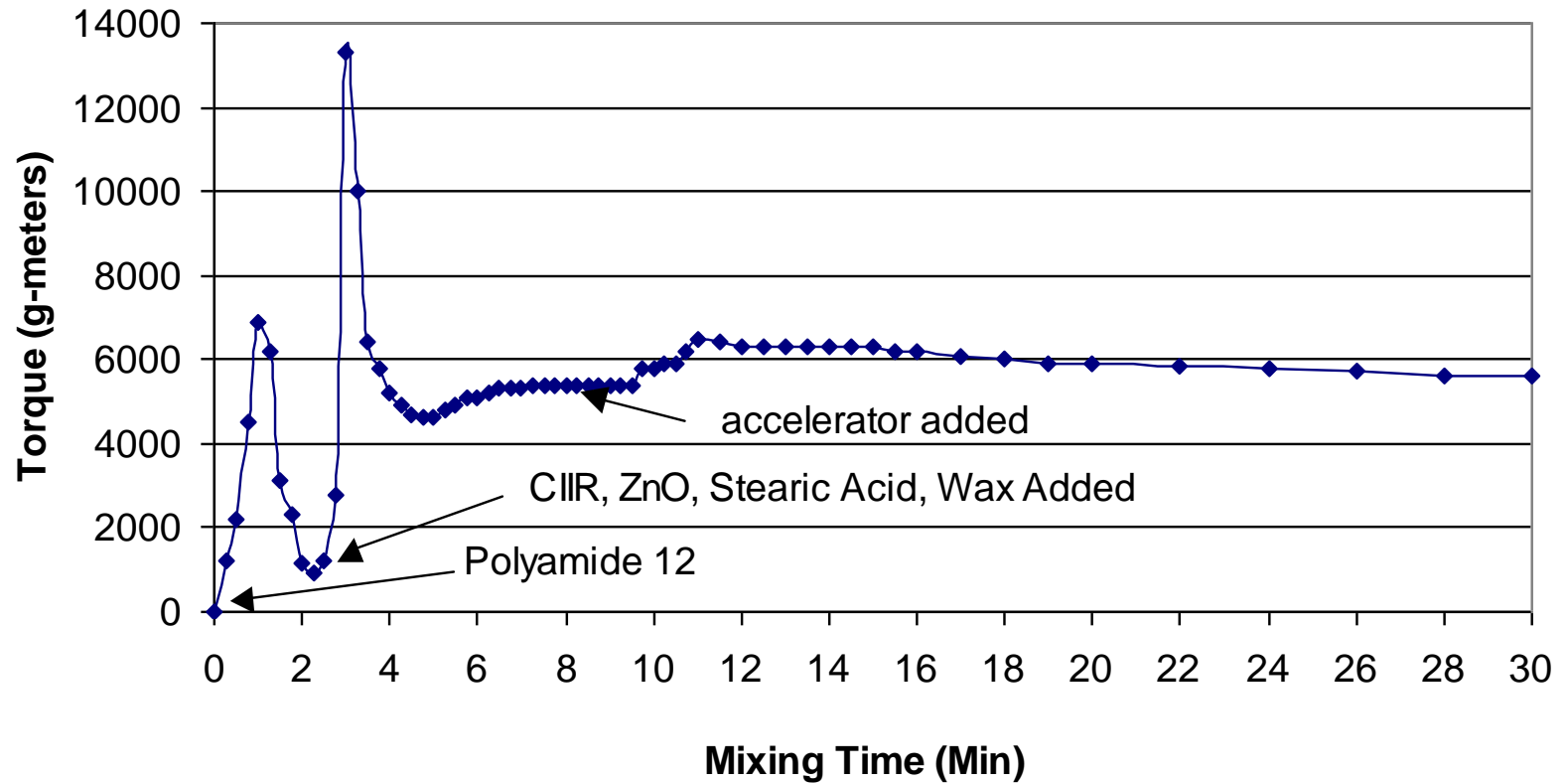
# Tensile Properties of Polyamide 12/ Rubber Blends - Non-Vulcanized



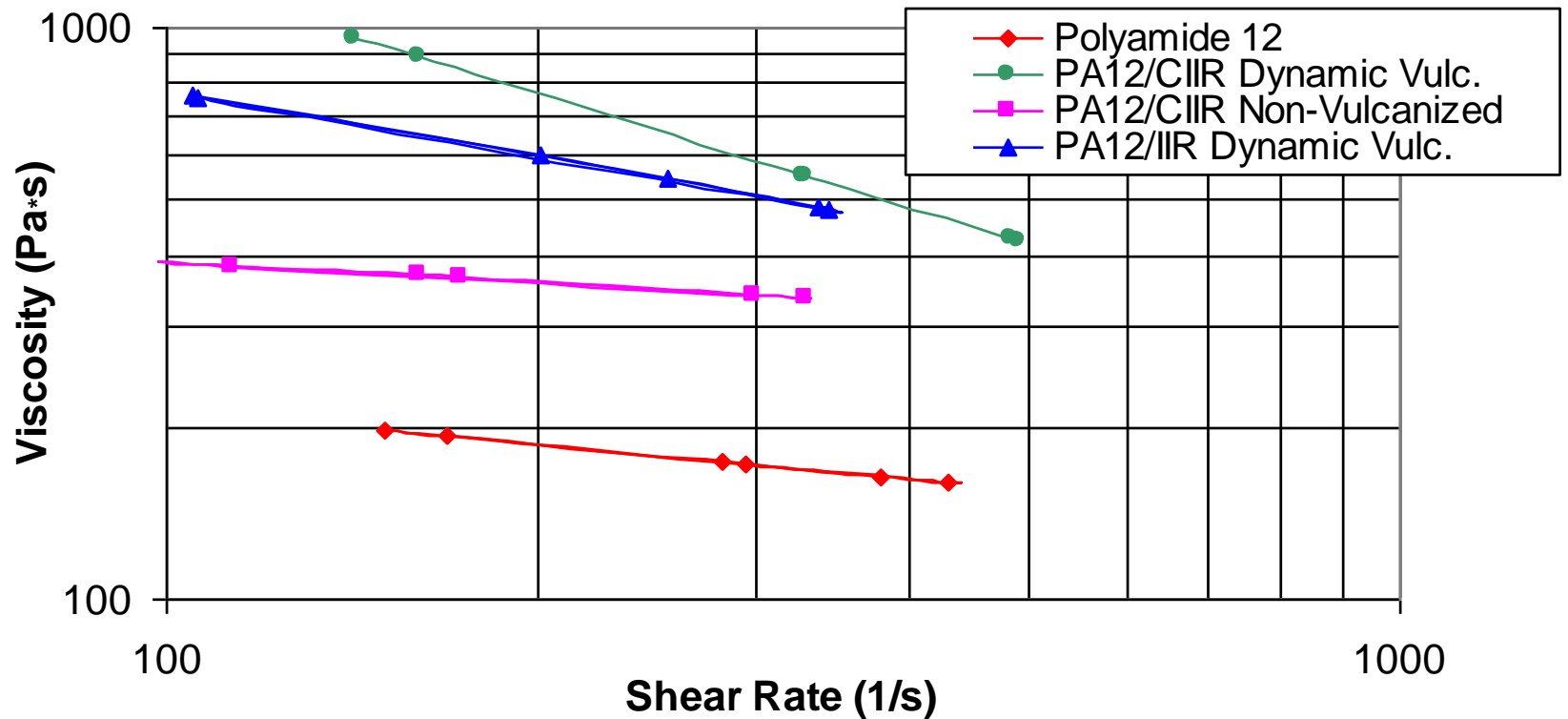
# Non-Vulcanization vs. Dynamic Vulcanization



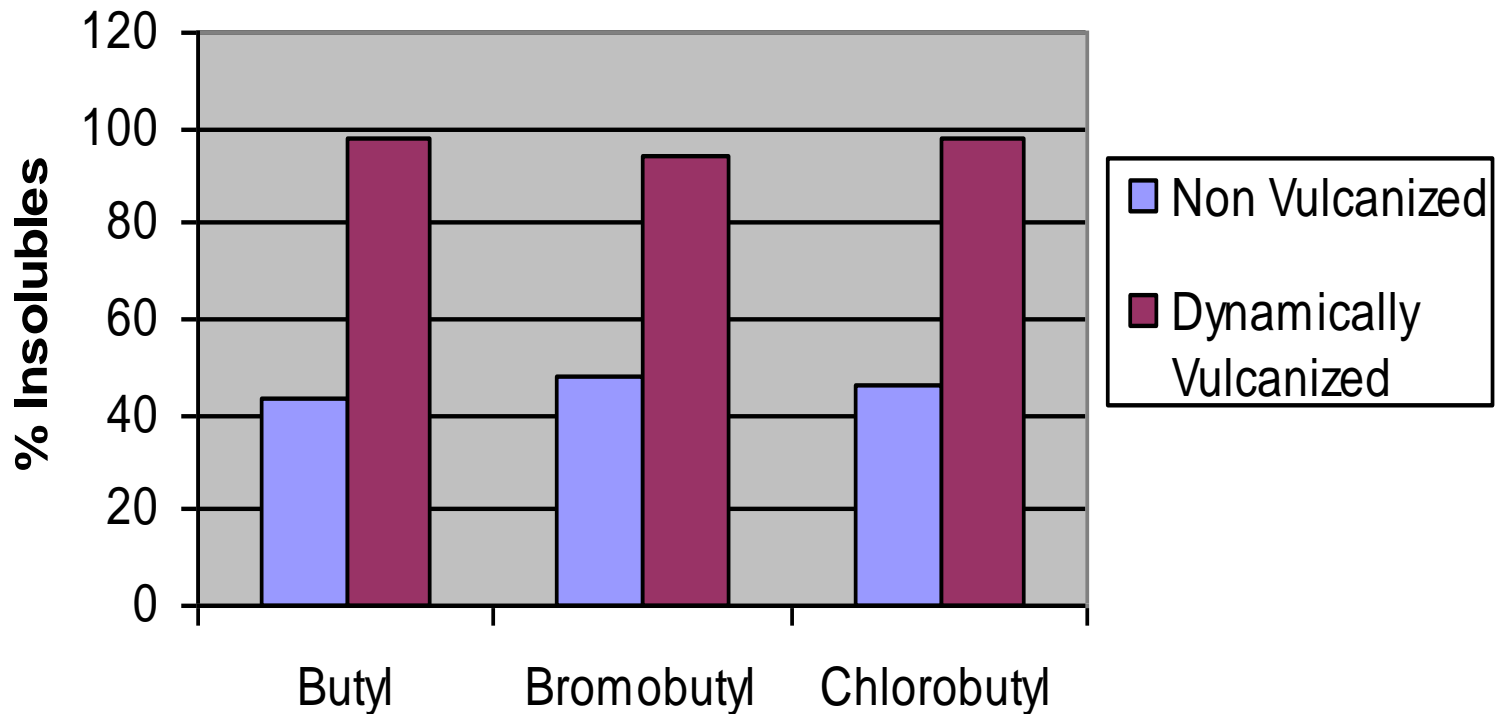
# Dynamic Vulcanization



# Rheology of PA/Butyl Rubber Blends – Comparison

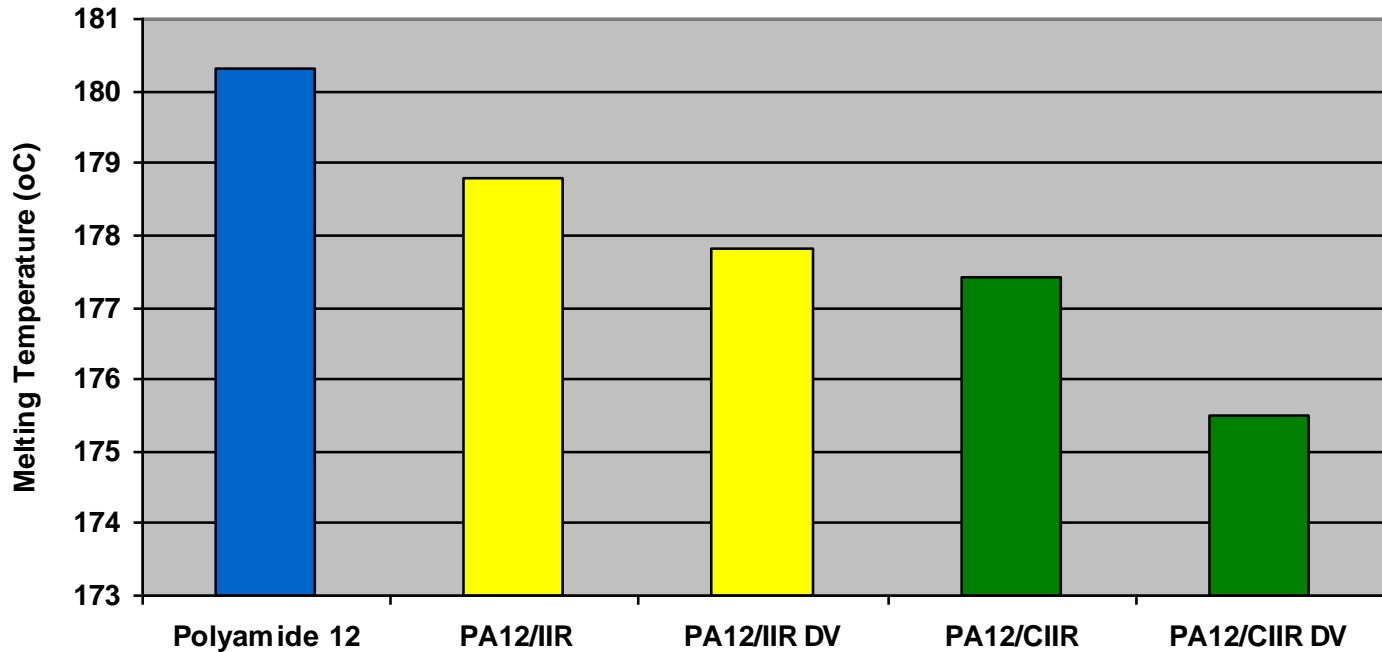


# % Insolubles – Non Vulcanized vs. Dynamically Vulcanized

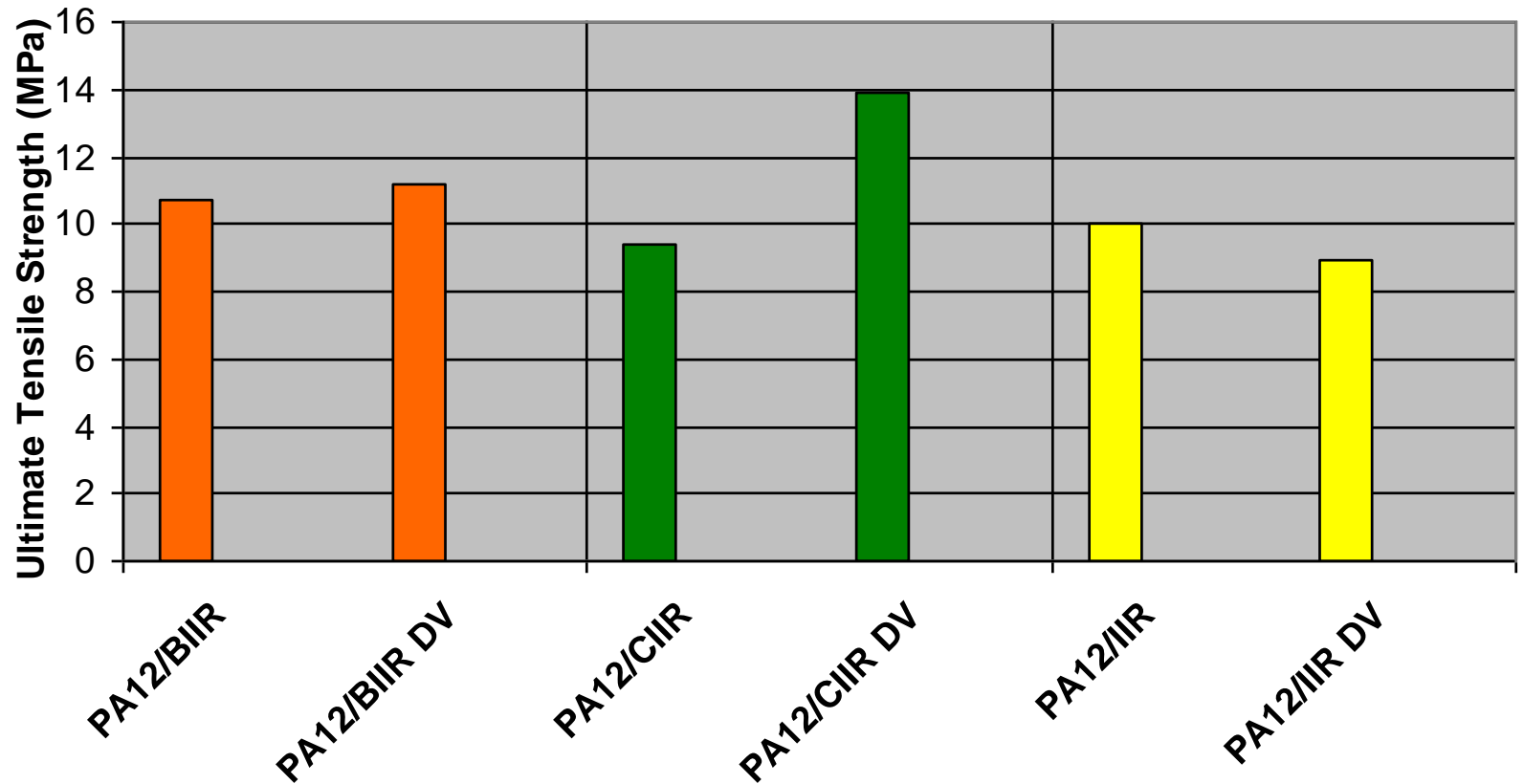




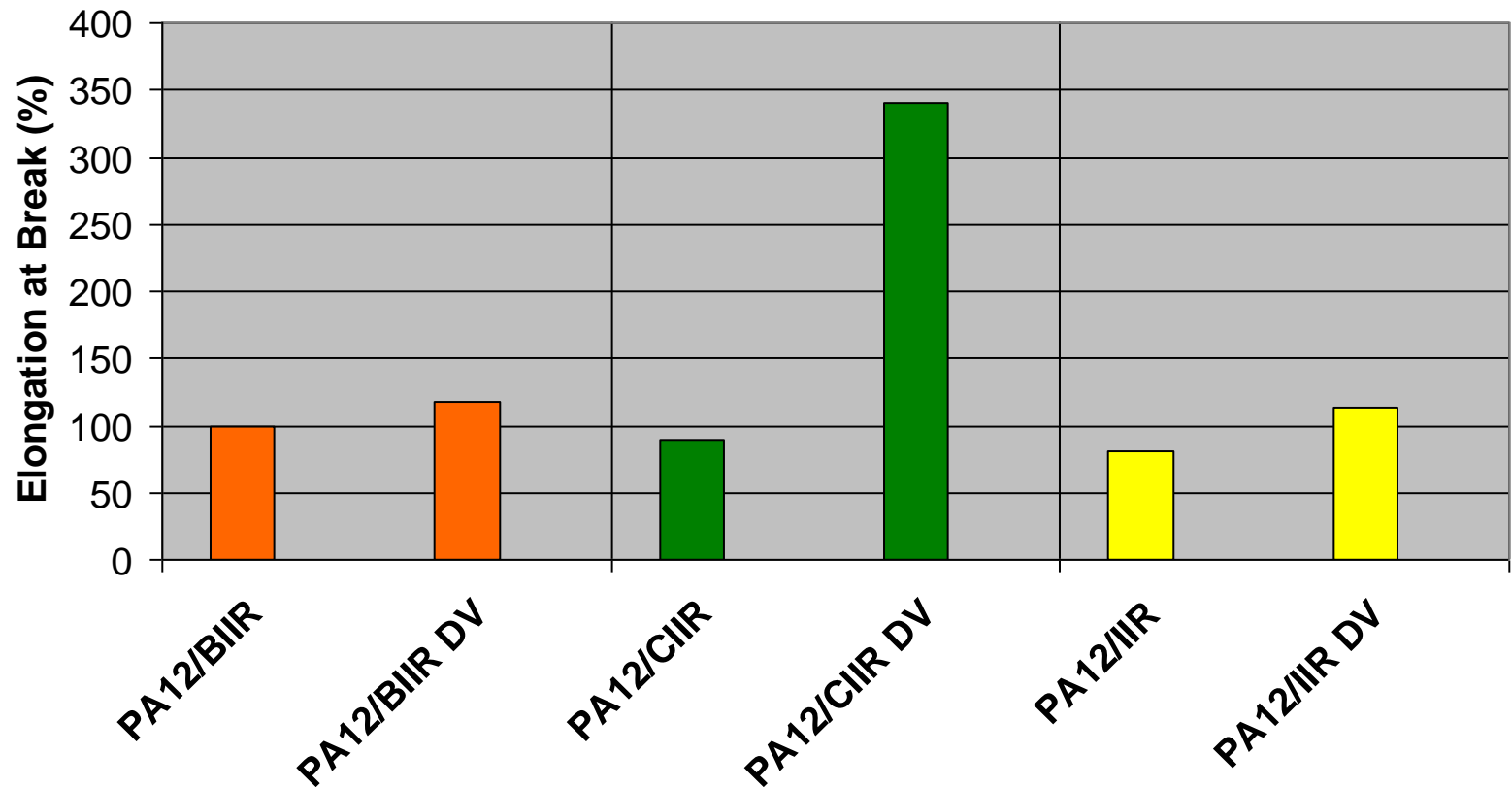
# Polyamide Melting Temperature - Effect of Rubber Type and Processing



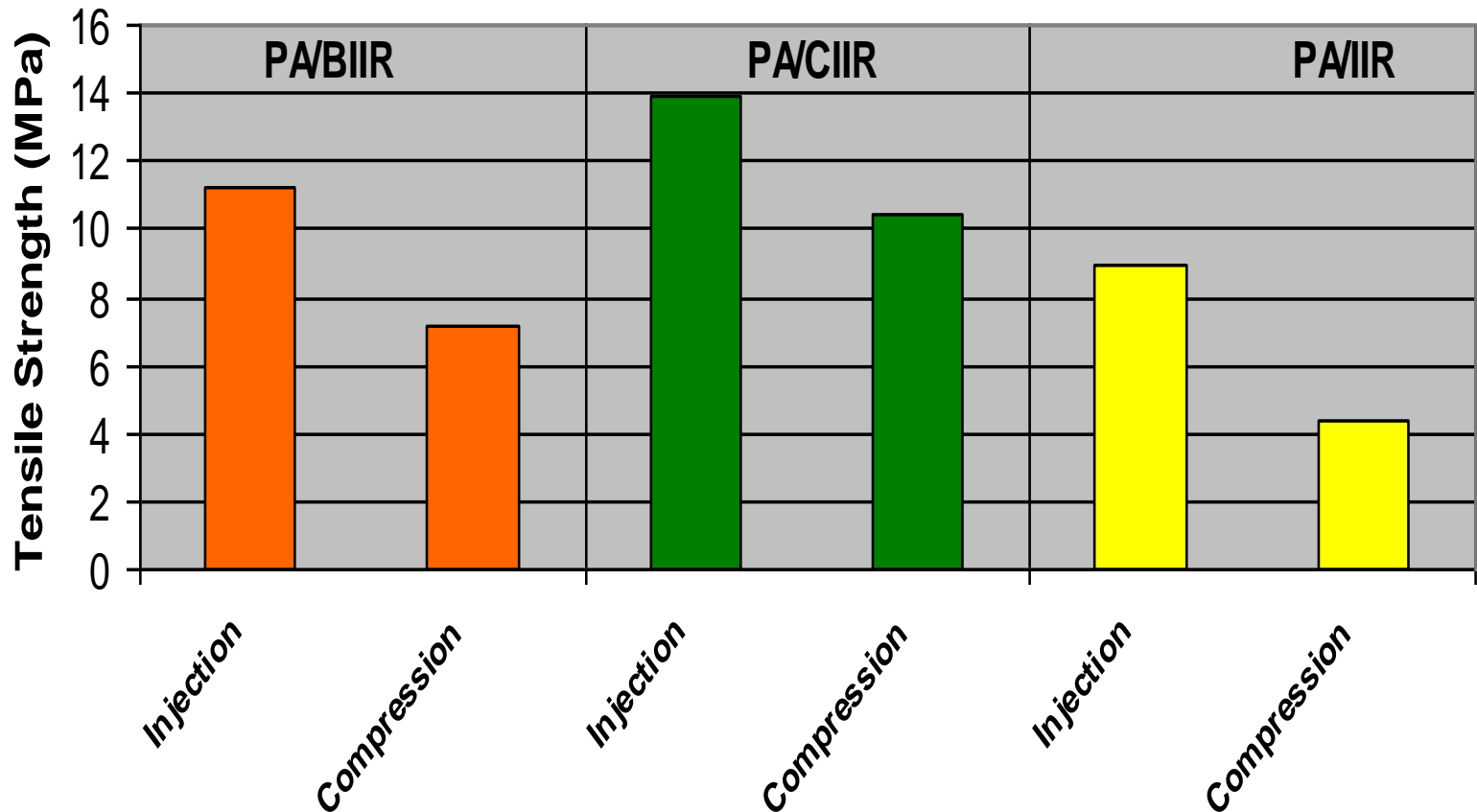
# Comparison of Tensile Strengths - Non-Vulcanized and Dynamically Vulcanized



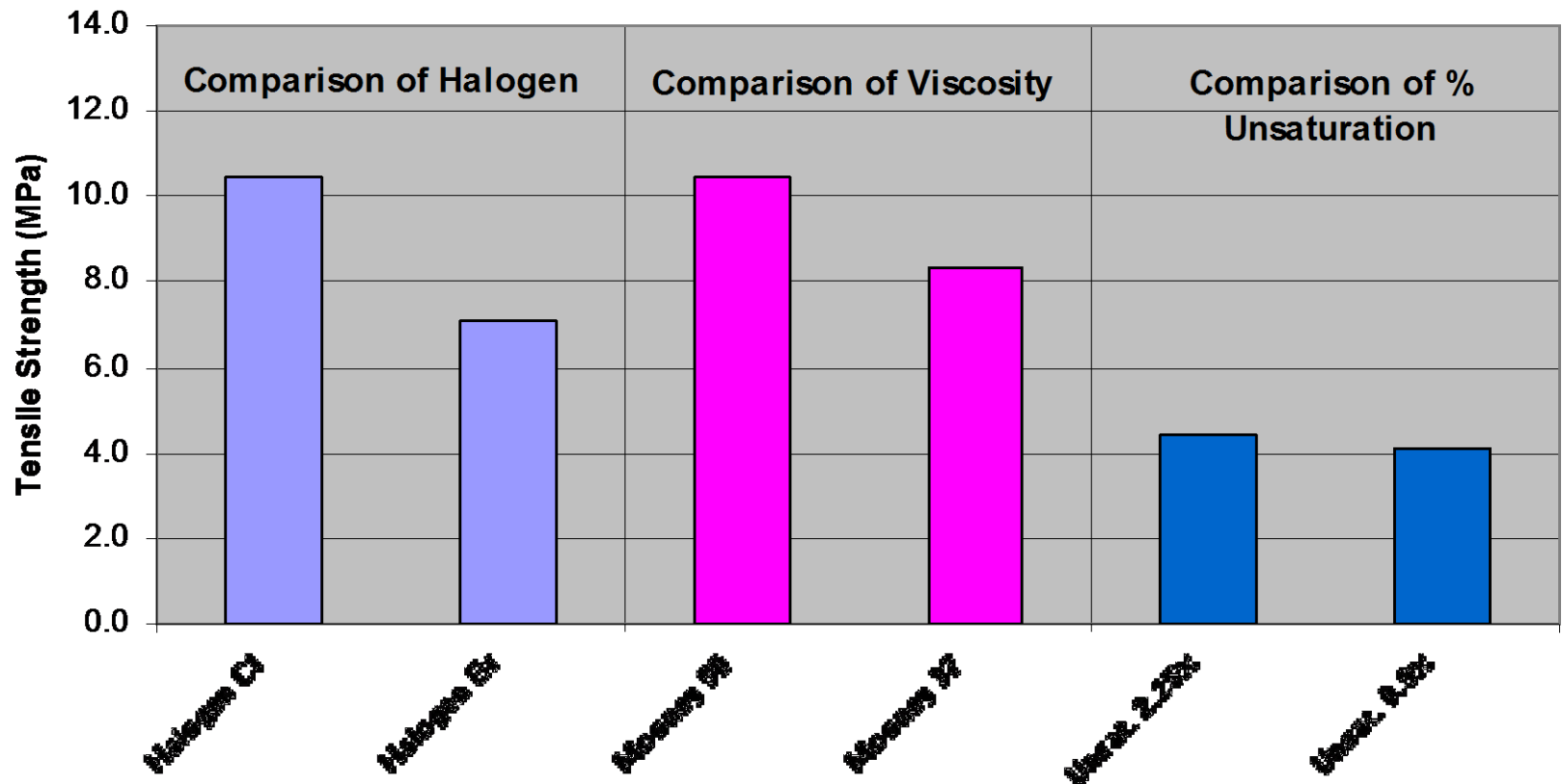
# Comparison of Elongations - Non-Vulcanized and Dynamically Vulcanized



# Effect Molding Procedure on Tensile Properties for Dynamically-Vulcanized 40/60 PA/Rubber Blends



# Effect of Rubber Properties on Tensile Strength for Dynamically Vulcanized 40/60 PA/Rubber Blends



# Conclusions

1. Compatible blends are formed under high shear mixing - both non-vulcanized and vulcanized.
2. Rheology of the blends depends on the method of preparation.
3. A sample is more processible at high shear in dynamically vulcanized blends.

# Conclusions

4. For dynamically vulcanized blends, the highest tensile and elongation values are obtained with CIIR as the blend component.
5. Mechanical properties seem to be affected by
  - a. type of halogen
  - b. Mooney viscosity of the rubber
  - c. method of processing
  - d. not affected by the unsaturation in the rubber phase.

# Acknowledgements

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