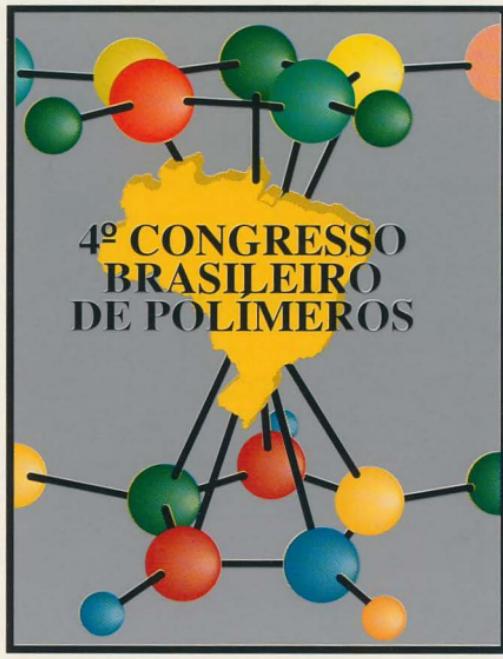


4º CONGRESSO BRASILEIRO DE POLÍMEROS

Salvador, 28 de setembro a 2 de outubro de 1997



Promoção:



Associação Brasileira de Polímeros

**DYNAMICAL MECHANICAL PROPERTIES OF THERMOPLASTIC
ELASTOMERS BASED ON REGIOSELECTIVE FUNCTIONALIZATION OF
POLY(ISOPRENE)-BLOCK-POLY(BUTADIENE)-BLOCK-POLY(ISOPRENE)
TRIBLOCK COPOLYMERS**

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Block copolymers with immiscible hard and soft segments present very special characteristics and useful properties ranging from thermoplastic elastomers to tough plastics. In the past several of these block copolymers have been intensively investigated as for example poly(styrene)-poly(butadiene)-poly(styrene), hydrogenated poly(butadiene)-poly(isoprene)-poly(butadiene) and polyether-polyester multiblock copolymers¹.

The modification of the properties of polydienes by the introduction of 4-substituted-1,2,4-triazolidine-3,5-dione groups has been intensively investigated²⁻⁴. The reaction of the 4-substituted-1,2,4-triazoline-3,5-dione with the double bonds of the polymer chains is fast and depends on the number of allylic hydrogens present. In this way cis/trans-poly(isoprene) reacts much faster with triazolidindiones than cis/trans-poly(butadiene)⁵. The difference in reactivity of the blocks towards 4-phenyl-1,2,4-triazolidine-3,5-dione was used to modify preferentially the poly(isoprene) block of the copolymers.

Poly(isoprene)-block-poly(butadiene)-block-poly(isoprene) copolymers with different compositions (10, 20, 30 and 50 weight% of isoprene) were obtained by anionic polymerization, using n-butyl-lithium as initiator and cyclohexan as solvent. The block copolymers were modified with 4-phenyl-1,2,4-triazoline-3,5-dione. The total degree of modification was varied between 5 and 20 mol% of the double bonds. Kinetic measurements and calculations allowed the determination of the degree of modification of each block for the different copolymers. In that way block copolymers of random copolymers with different polarities could be obtained.

The dynamical mechanical properties of the block copolymers have been investigated, using a Rheometrics Solid Analyser and a Rheometrics Dynamic Analyser. Figure 1 shows the storage and loss modulus curves for the unmodified and modified copolymer IBI-25/50/25 (50 weight% isoprene). For the unmodified sample, no phase separation could be detected, but even at degrees of modification as low as 5% two phases could be observed in the dynamical mechanical curves. Similar results have been obtained for the other copolymers. Some of the samples show typical behaviour of thermoplastic elastomers, while others behave as though plastics.

The results obtained show that it was possible to control the properties of the block copolymers by selective modification of the blocks.

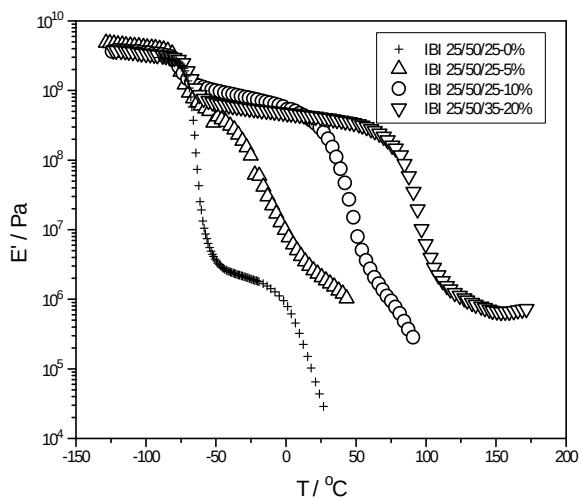
Bibliography:

1. Legge, N.R.; Holden, G.; Schroeder, H.E. (Eds) *Thermoplastic Elastomers*. München, Hanser Verlag, 1987.
2. Butler, G.B.; Leong, K.W. J. Macromol. Sci.-Chem. A14, 287 (1980).
3. de Lucca Freitas, L.; Stadler, R. Macromolecules 20, 2478 (1987).
4. Hellmann, J.; Hilger, Ch.; Stadler, R. Polym. Adv. Technol. 5, 763 (1994).
5. Fracasso, R. Dissertação de Mestrado, Curso de Pós-Graduação em Química da UFRGS, 1992.

Acknolegments:

CNPq, FAPERGS, CAPES/DAAD

a)



b)

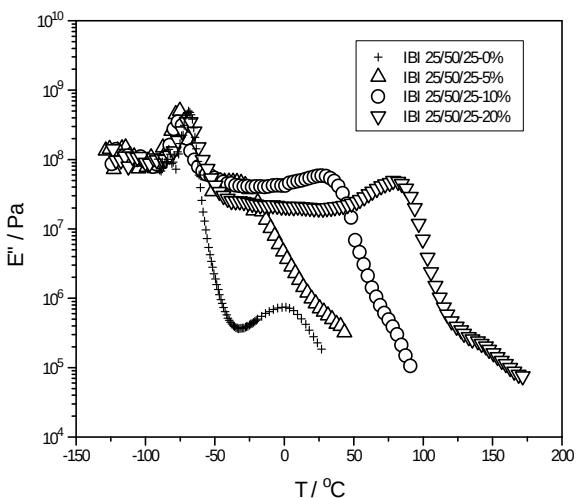


Fig. 1: Storage (a) and loss (b) modulus curves for the block copolymer IBI 25/50/25 with different degrees of modification.