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Synthesis of solution styrene-butadiene rubber (SSBR) with bifunctional initiators and its formulation for tread

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The development of environmentally friendly "green" tires has received a lot of attention in recent years. This line of operation involves improvements in the tire's environmental and operating characteristics: the reduction of rolling loss, reduction fuel consumption and pollutant emissions, and improvements in tire traction characteristics and wear resistance. One of the rubbers that meets these requirements is functionalized styrene butadiene rubber (SSBR) with high vinyl contents. The synthesis of these rubbers is usually made by sec-BuLi or n-BuLi as the monofunctional initiator. However, the preparation of rubbers from bifunctional initiator (using DIB as diolefin) may offer many advantages: for example, the reduction of the polymerization time can occur, since the polymer chain simultaneously grows in two directions, and also allows the functionalization of both chain ends in the final of the polymerization process. For this reason, the goal of this work is to describe the synthesis and formulation of SSBR using multifunctional initiator produced from the reaction between m-DIB and n-BuLi, and the evaluation of some properties against the formulation of tread. The results indicate a formation of polyfunctional initiators that led to polymer products with multimodal molar mass distributions. It was also observed the formation of a polymer with random fraction of styrene in the chain and high vinyl content (higher than 60%). The rheological results suggested that good traction properties for applications in tire synthesis due to low hysteresis. Promising polymer for tread, since chains of lower molar mass are also present which may be useful for processing. Another factor was the efficiency of the functionality of the ends of chain with siloxane. In terms of processing, the results suggest that the property of the rubbers is positively affected when initiated by multifunctional initiators, since the ends have been functionalized leading to a smaller number of pendant terminals. Generally, it has been observed that the functionality of the chains led to a better dispersion of the formulation, since the polarity change of the coupling matrix, as expected.

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