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# NASA TECH BRIEF

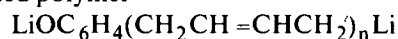
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## Polymer Containing Functional End Groups Is Base for New Polymers

Butadiene has been polymerized with lithium-p-lithiophenoxide (lithium salt of p-hydroxyphenyl lithium) to produce a linear polymer containing an oxy-lithium group at one end and an active carbon-lithium group at the other end. This polybutadiene-based polymer



is one of a class of macromolecules that have been designated "living polymers." Such polymers will remain stable even after long storage periods, and will still be capable of reacting with specific monomers to form more complex polymers.

These living polymers represent a new approach to the preparation of difunctional polymers in which structural features, molecular weight, type, and number of end groups can be controlled. For example, the polybutadiene-based living polymer has been reacted with silicon tetrachloride to form a four-armed star polymer centered on the silicon atom and terminated at each arm by a lithiophenoxide group. The living polymer has also been reacted with carbon dioxide to produce a polymer terminated at one end with a phenolic hydroxy group and at the other with a carboxyl group. The latter polymer molecule can be reacted at either end or at both ends to form star, block, and graft polymers. These new polymers have potential application in the development of

binders, adhesives, elastomers, protective coatings, and structural materials where specific chemical and physical requirements must be met.

### Note:

Requests for further information may be directed to:

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### Patent status:

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## Polymers Containing Sulfur and Nitrogen

The polymers described in this report were prepared by the reaction of a mixture of sulfur and nitrogen with a diene monomer. The reaction was carried out in a sealed tube at 400°C for 24 hours. The resulting polymers were characterized by elemental analysis, infrared spectroscopy, and viscosity measurements. The polymers were found to have a molecular weight of approximately 10,000 and a glass transition temperature of about 150°C. The polymers were soluble in a variety of organic solvents and exhibited good mechanical properties.

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