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Microstructure of Polyphenylacetylene and Other Acetylenic Polymers

Virgil Percec [a]
[a] Department of Macromolecular Science, Case Western Reserve University Cleveland, OH, 44106
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MICROSTRUCTURE OF POLYPHENYLACETYLENE AND OTHER ACETYLENIC POLYMERS

VIRGIL PERCEC
Department of Macromolecular Science
Case Western Reserve University
Cleveland, OH 44106

Abstract. ^{1}H- and ^{13}C-NMR studies carried out on poly(phenylacetylene)s and poly(pentadeutero-phenylacetylene)s prepared with Ziegler and metathesis type catalysts, revealed two different mechanisms which control the microstructure of acetylenic polymers.

For the Ziegler-type catalysts, thermal induced reactions (intramolecular cyclization, aromatization, chain scission and cis-trans isomerization) of the cis-double bonds (isomerization after double bond formation) are responsible for the polymer microstructure. (For a review see: Progr. Polym. Sci., 8, 133 (1982).) Both isomerization "after" double bond formation as well as isomerization "before" double bond formation are responsible for the microstructure of polymers obtained with metathesis type catalysts. In both cases, the polymer molecular weight is controlled by the intramolecular cyclization of the cis-polymer chain end. Under reaction conditions where isomerization occurs mainly "before" double bond formation, "pure" trans polymers having very high molecular weight are obtained (Polym. Prepr., 24(1), 239 (1983); Polym. Bull., 9, 548 (1983)).

The microstructure of several other acetylenic polymers will be commented on in relation with the polymerization mechanism and with the microstructure of $(CH)_x$.