TRANSITION METAL CATALYSTS FOR OLEFIN POLYMERIZATIONS: NOVEL POLYMER STRUCTURES AND FUNCTIONAL POLYMERS

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Abstract

Polyolefins constitute one of the largest and widely used polymers. They are generally inexpensive and the diversity of structures, and hence, properties that one can access using a wide variety of transition metal complexes make this area of study a fascinating subject in polymer science.

Our interest in this area is currently focused on two aspects. One, rational design of transition metal catalysts to produce ultrahigh molecular weight poly (ethylene)s and, second, to synthesize functional polymers with well-defined end functionalities.

The lecture will present some results from our ongoing research in this area. Novel Group IV transition metal complexes based on titanium and zirconium with open frameworks has been found to lead to very high molecular weight polyethylenes. Ability to control molecular weights in such polymerization has remained a challenge. We have studied the efficacy of arylsilanes to promote silanolytic chain transfer in ethylene polymerization using bis [N (3-tert-butylsalicylidene) 2,3,4,5,6-pentafluoroanilanato] titanium (IV) dichloride as catalysts. A novel P-C-N-C-P framework capable of forming a six member chelate with nickel (II) andpalladium (II) has been studied for ethylene andnorbornene polymerization. The nickel complexes promote linear polymerization of ethylene without any “chain walking “ process.

An approach to the synthesis of succinic anhydride terminated polyethylene has been studied. Such polyolefins with reactive functionality can be used to make novel copolymers, especially with long chain aliphatic diol monomers derived from biorenewable resources.

Glimpses of results from ongoing research in these areas will be presented.