THE IMPORTANCE OF HAVING DETAILED ETHYLENE/α-OLEFIN POLYMERIZATION KINETICS WITH METALLOCENE CATALYSTS FOR DEVELOPING NEW POLYOLEFIN PRODUCTS

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ABSTRACT

This presentation will explain the methodology developed in our laboratories to measure the detailed polymerization kinetics of ethylene and α-olefins with metallocene catalysts. This information is essential to scale up experimental results measured in R&D laboratories to industrial reactor scale, to optimize polymerization conditions, and to produce new polyolefin grades.

Several conditions affect polymerization kinetics with metallocenes: 1) metallocene type, 2) activator type, 3) polymerization temperature, 4) catalysts/activator ratio and concentrations, 5) impurity scavenger concentration, and 6) α-olefin/ethylene ratio, among others. We will show how the effect of these parameters on polymerization rate and polymer properties can be quantified with theoretical or semi-empirical equations and how this information can be used to predict the behavior of industrial polymerization reactors from laboratory-scale data. These kinetic models are particularly important when one plans to make polyolefins with complex microstructures (bimodal or trimodal, for instance) by using more than one metallocene type simultaneously and/or a series of polymerization reactors.