MODEL POLYETHYLENES: FROM POLYMER CHEMISTRY TO POLYMER PHYSICS AND APPLICATIONS

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Access to model polyethylene and polyethylene-based materials (high degree of structural, compositional and molecular weight homogeneity) is necessary in order to elucidate, based on polymer physics, the structure-property relationships, which are key to improving polymer performance and design of new materials. The synthesis of model polyethylenes by anionic polymerization of butadiene (C4 polymerization, chain grows by four carbon atoms at a time) high vacuum techniques, followed by hydrogenation or polyhomologation (C1 polymerization or polyhomologation, chain grows by one carbon atom at a time) of ylides is demanding, time consuming and often leads to a small quantity of products. Nevertheless, this is a trivial price to pay given the tremendous potential of these materials to understand/improve the properties of industrial polyethylenes and select the appropriate structures needed for specific applications. A few examples will be given, showing the importance of such model polyethylenes and polyethylene-based materials in conventional and high-tech applications.