INVESTIGATION OF MULTISTAGE PROPENE POLYMERIZATIONS USING A SINGLE REACTOR SETUP

Theresia Hackl, Christian Paulik

Institute for Chemical Technology of Organic Materials, Johannes Kepler University, 4040 Linz, Austria

Since the beginning of the industrial production of polypropylene about 60 years ago, it has become the most important plastic in addition to polyethylene [1]. The reason for the commercial success of polypropylene is the outstanding properties, which can be adapted for the most varied applications. Moreover, the monomer is cheap and easily accessible [2]. Multistep polymerizations are carried out in order to produce a wide variety of propene homo- and copolymers [1,2].

In course of this work, all polymerizations were carried out in a 5 L Büchi batch reactor. For this purpose, the reactor was adapted in order to be able to carry out both, gasphase and experiments in liquid monomer during one polymerization procedure. As catalyst, a commercial available Ziegler-Natta system of the 4th generation was used with triethylaluminum as cocatalyst. Cyclohexylmethyldimethoxysilane (C-Donor) and dicyclopentyldimethoxysilane (D-Donor) were used as electron donors.

By changing reaction parameters such as hydrogen content, temperature and time, their influence on the reaction progress and polymer properties is observed. To determine the material properties, the resulting polymer powders were analyzed by size exclusion chromatography (SEC) and differential scanning calorimetry (DSC).

[1] D. B. Malpass, I. Elliot, *Introduction to Industrial Polypropylene*, **2012**, John Wiley & Sons, Inc. Hoboken, New Jersey

[2] H. Mark, *Propylene Polymers*, Encyclopedia of Polymer Science and Technology, **2003**, 3rd Edition, Vol. 11, pp. 287-356, John Wiley & Sons