Controlling the selectivity of chromium-based ethylene oligomerisation and polymerisation catalysts

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Metal-catalysed ROP of macrolactones to unprecedentedly high molecular weight polyesters.

R. Duchateau, A. Heise, I. Van der Meulen, E. Gubbels.

Laboratory of Polymer Chemistry - Eindhoven University of Technology (NL)

Catalytic ring-opening polymerisation (cROP) of cyclic esters is widely used for the synthesis of aliphatic polyesters. It is commonly agreed that the driving force behind the cROP of lactones is the release of ring-strain in the transition from the cyclic ester to the polyester chain. It is therefore not surprising that only a few examples of metal-catalysed ROP of macrolactones like pentadecalactone can be found in the literature, which report only low molecular weights (up to $M_n = 30$ kg/mol). It is thus commonly accepted that efficient polymerisation of macrolactones is only possible by enzymatic catalysis.

In this contribution we discuss the successful metal-catalysed ROP of various macrolactones to high molecular weight polyesters ($M_n > 200,000$ g/mol) were obtained. These results are unprecedented in the literature, they challenge the common theory of ring-tension driven cROP and they open doors to new (functional) materials, which were not available before.

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