Semi-Hydrogenated, Asymmetric Metallocene Catalysts for the Propylene Polymerization

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The hydrogenation of rac-[1-(9-\(\eta^5\)-fluorenyl)-2-(5,6-cylopenta-2-methyl-1-\(\eta^5\)-indenyl)ethane]metallocene dichlorides (1a: Zr, 1b: Hf) with \(\text{PtO}_2 \cdot \text{H}_2\text{O}/\text{H}_2\) is reported. The diastereoselective formation of exclusively rac-[1-(2,3,4,5,6,7,8,9-octahydro-\(\eta^5\)-fluorenyl)-2-(2-methyl-1,4,4a(R,S),5,6,7,7a(S,R),8-octahydro-s-\(\eta^5\)-indacenyl)ethane]metallocene dichlorides (2a: Zr, 2b: Hf) was shown by \(^1\text{H}-\text{NMR}\) and by X-ray analysis of 2a. Both compounds were activated \textit{in situ} with triisobutylaluminum/\(\text{PhC}^+\text{[B(C}_6\text{F}_5)_4^-}\) and tested as catalysts in propylene polymerization reactions. Comparison to the non-hydrogenated complexes revealed a decrease in molecular weight of the polymer and in catalyst activity. Experiments at elevated temperatures resulted in a lower stereospecificity and reduced isotacticity values indicating a polymerization mechanism analogous to \(\text{C}_2\)-symmetric catalysts.

Key words: Metallocene Polymerization Catalyst, Polypropylene, Diastereoselective Hydrogenation