SINGLE-SITE CATALYSTS FOR THE POLYMERIZATION OF POLAR COMONOMERS AND IN WATER

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We are interested in the potential of single-site catalysts to polymerize polar monomers and in polar solvents, particularly water. Three different types of single-site catalysts are being investigated. Most of our work so far has involved using 2,6-diacetylpyridine(2,4,6-trimethylanil)iron(II) chloride with the cocatalyst methylaluminoxane to polymerize ethylene with methylacrylate. We synthesized the iron based catalyst using a two-step process and modifying a literature procedure resulting in a high percentage yield. The incorporation of the methylacrylate next to ethylene is relatively low leading to copolymers with only percents of the comonomer in the single digits. However, the catalyst is highly active and the polymer molecular weights are satisfactory. We also have synthesized successfully ethylene/acrylate copolymers with dimethylsilyl bis(4,5,6,7-tetrahydro-1-indenyl)zirconium dimethyl with boron tris(pentafluorophenyl) as cocatalyst. These catalysts lead to a higher incorporation of the polar monomer at moderate activities. For polymerizations in aqueous solutions we are applying two nickel enolate catalysts. These are formed in-situ and lead to nickel complexes which turn grayish during the polymerization. To reach higher activities we synthesized a ligand bearing a trifluorocarbon group. After initial polymerizations with toluene as solvent, we are applying these catalysts in aqueous emulsion polymerizations of ethylene and polar comonomers.