

A clue for the active sites of Cr-based ethylene polymerization catalysts ?

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Transition metal catalysts play a central role in the formation of polyethylene (PE), a bulk commodity material made on over 80 million metric tons per year. The Phillips catalyst, which contains chromium dispersed on silica, was the first commercialized material that could produce PE industrially and accounts for 40 –50 % of global high density PE. Despite 60 years of intensive research the active catalytic sites of the Phillips catalyst remains unknown, though X-ray Absorption Spectroscopy shows that Cr(II) species are formed, inferring that they are responsible for catalysis. We synthesized well-defined Cr sites on silica using Surface Organometallic Chemistry and tested these materials for ethylene polymerization. Comparison of the XAS features of this material revealed novel information about active sites. These well-defined Cr sites exhibit activities exceeding the Phillips catalyst, though the PE produced by these two materials is very similar indicating that the same active sites must be responsible for catalysis.

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