Heterogenized M-Salen Catalysts for Enantioselective Reactions: Catalyst Design, Structure-Reactivity Trends, and Deactivation Pathways

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Presented by…

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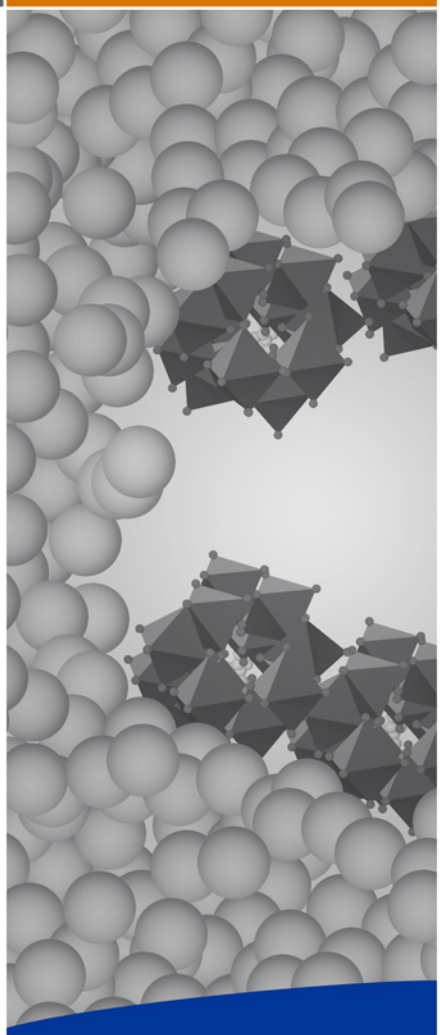

Abstract

Metal salen complexes are widely applied as catalysts for numerous important enantioselective reactions. The reactions catalyzed by metal salen complexes generally follow either (i) monometallic mechanisms (e.g. Mn-salen for epoxidation or Ru-salen for cyclopropanation), whereby a single metal complex promotes the catalytic reaction or (ii) bimetallic mechanisms, where cooperation between two metal complexes is required for efficient catalysis (e.g. Co-salen for epoxide ring-opening or Al-salen conjugate additions of cyanide). The design of effective heterogenized catalysts should therefore take into account the reaction mechanism, as reactions in category (i) are hypothesized to be optimized by accessible yet isolated supported metal salen complexes, whereas reactions of type (ii) are hypothesized to require efficient complex mobility, facilitating metal salen – metal salen cooperative interactions.

Here, several new designs for (a) soluble polymer or oligomer supported metal salen complex catalysts, (b) insoluble polymer resin supported complexes, and (c) insoluble porous silica supported are described. Their utility in the cooperative Co-salen catalyzed hydrolytic kinetic resolution of epoxides and the monometallic Ru-salen catalyzed enantioselective cyclopropnantion of olefins is reported. The kinetics of the reactions using both fresh and recycled catalysts are compared. Most catalysts are shown to deactivate during use, and the mechanisms of deactivation are explored. Strategies to reduce or mitigate catalyst deactivation are described.

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January 31, 2011

EMSL Auditorium

1:00 pm