

Activity and Selectivity Factors that Limit Light Olefins Production: Some Proposed Solutions

M.B.B. Almeida, A.R. Pinho, L.R. Monteiro, R.N. Castro, Y.L. Lam and O. Chamberlain

Research and Development Center - Petrobras
Rio de Janeiro – Brazil

Abstract

The increased demand for light olefins, in particular, propylene, motivated the refiners to maximize their production in FCC operations. This increase has been commonly achieved by employing additives. The conventional ones contain only medium pore ZSM-5 zeolites that act on gasoline range precursors and contribute very little to the cracking of larger feed molecules. Hence, the use of excessive amount of these additives decreases the overall activity of the catalyst system and limits the supply of precursors.

This work shows several approaches that were successful to diminish or overcome these activity effects. They include incorporating a component active in conversion of heavier molecules in the additive and optimizing formulations with high ZSM-5 levels. Yet, increased quantities of ZSM-5 and abundant precursors still may not guarantee continuous increase in light olefins production. Among the various factors that impose limits to the olefin yields, further reactions of these olefins should not be overlooked. In this work, we used some model compounds to show that light olefins form oligomers and also react by hydrogen transfer forming saturated alkanes and aromatics under typical FCC conditions. Hence, innovative catalytic solutions have to be developed to decrease the selectivities of these undesirable reactions.