TETRALIN HYDROGENATION OVER Ir-Pt/SBA-15. OPTIMIZATION BY EXPERIMENTAL DESIGN.

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Bimetallic catalysts have received considerable attention for hydrotreating (HDT) because they show high activity. The features of the catalysts here studied are going to be correlated with their catalytic performance in the hydrogenation of tetralin at mild conditions. The final goal is to find the optimal proportion of each metal in order to be more active and the best reaction conditions (temperature and amount of catalyst). The statistical experiments design is the process of planning an experiment to obtain appropriate data that can be analyzed by statistical methods, to produce concrete and valid conclusions. One of the main advantages in the response curve is to visualize the response for all levels of the experimental factors Experiment design response surface methodology (RSM) is used in this work to model and to optimize the process. Platinum and Iridium nanoparticles were incorporated into SBA-15 support by the wet co-impregnation method. Ir content was set as 1wt. % and Pt was varied from 0 to 1wt. %. The catalysts were characterized by XRD, BET, XPS, TEM, ICP and TPR. XRD profiles are characteristic of the two-dimensional p6mm hexagonal mesostructure with d100 spacing of 10.16 nm; where the d100 spacing upon Ir and Pt incorporation were quite similar to pristine SBA-15. The TEM images and XPS demonstrate that the metal particles were mainly present inside the porous and XPS and TPR corroborated the reduced state of the metals. The catalytic activity was measured in a 4563Parr reactor at 15 atm of hydrogen and 360 rpm. Feed consisted in 50 mL of tetralin in Dodecane, the amount of tetralin is set according to the ratio of catalyst mass/mass reagent corresponding to each reaction. The application of this methodology allows a better understanding of the influence of the different factors: content of metal on catalyst (A), relationship: mass of catalyst/reagent mass (B) and reaction temperature (C), on two responses: conversion at 3 h and at 5 h of reaction time. These factors were carefully selected taking account the influence of the parameters in the reaction. The design was analyzed by Statgraphics and Statistica Soft. We found that, the variable Catalyst has the best influence over the Conversion at the 95.0% confidence level, according to the Pareto.

[1] T. Matsui, M. Harada, K.K. Bando, M. Toba, Y. Yoshimura, J. Jpn. Petrol. Inst. 47 (2004)

[2] B. Pawelec, R. Mariscal, R.M. Navarro, S. Van Bokhorst, S. Rojas, J.L.G. Fierro, Appl. Catal. A: Gen. 225 (2002)

[3]G.E.P. Box, K.B. Wilson, Series B, 13, 1-45 (1951)

Keywords: Iridium-platinum containing SBA-15; Tetralin Hydrogenation; Experimental Design

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