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INHIBITION OF BENZOTHIOPHENE HDS BY QUINOLINE ON PdMo AND CoMo/AL₂O₃ CATALYSTS.

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Hydrodesulfurization (HDS) carried out industrially by means of conventional alumina supported CoMo catalysts is severely inhibited by basic nitrogen compounds present in the feed [1]. This is because these bases adsorb on the alumina support and also compete with sulfur reactants when interacting with active sites of the metal sulfide phase. This undesirable effect diminishes the performance of catalysts and becomes more important in hydrotreatment of heavier feeds with higher nitrogen content.

Recently, we observed that Mo/Al₂O₃ sulfide catalysts promoted by Rh, Ru and Pd showed in simultaneous HDS of thiophene and HDN of pyridine higher HDS activities than conventional CoMo/Al₂O₃ catalysts [2]. This effect was explained later by higher C-N bond cleavage activity of Rh and Ru promoted Mo catalysts which allows an easier removal of the adsorbed hydrogenated reaction intermediates [3].

In this work, the effect of quinoline on benzothiophene HDS was compared with the effect of pyridine on thiophene HDS. This is because benzothiophene and quinoline are closer to practical application. The main goal is to find, if the higher nitrogen tolerance observed during thiophene reaction occurs also with heavier sulfur and nitrogen molecules. Mo/Al₂O₃ modified by Pd was selected for this study.

The support was γ -alumina (235 m²/g, Süd-Chemie AG). The catalysts contained 9 wt. % Mo and 2.0 % Co or 0.76 % Pd. The PdMo catalyst was prepared by impregnation of sulfided Mo/Al₂O₃ by solution of Pd acetylacetonate. Catalysts were sulfided by 10 % H₂S/H₂ at 400°C/1h. The benzothiophene HDS was carried out at 330°C/16 bar in the gas phase in an integral flow reactor with fixed bed of catalyst. The feed contained 1.8 wt.% S and 0, 500 or 1500 ppm of N. Decane was the solvent. Preliminary results up to now obtained are compared and discussed with relation to thiophene reaction.

Acknowledgement

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References:

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