Proton magnetic resonance thermal analysis of petroleum derived asphaltene with Co smectite and CoMo alumina based catalysts. Iwamatsu, Eiji; Hayashi, Eiji; Sanada, Yuzo; Ali, M. Asharaf; Ahmed, Shakeel; Hamid, Halim; Sakurovs, Richard; Yoneda, Toshikazu. Research Institute, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia. Journal of the Japan Petroleum Institute (2002), 45(3), 135-143. Publisher: Japan Petroleum Institute, CODEN: JJPIAP ISSN: 1346-8804. Journal written in English. CAN 137:96019 AN 2002:331275 CAPLUS

Abstract

The catalytic transformation of petroleum-derived asphaltene with Co loaded smectite and CoMo loaded alumina based catalysts was studied in the range from 40 to 420°C using proton magnetic resonance thermal anal. (PMRTA). Residual hydrogen as a qual. measure of the hydrogen remaining in the sample and second moment (M2T16), which is sensitive to mol. mobility, were obtained as a function of temp. Both residual hydrogen and M2T16 of the asphaltene were dependent on the properties of the coexisting catalyst. Metal oxides in the Co porous saponite and CoMo alumina based catalysts, which are active for the transformation of asphaltene, were probably reduced to the metals and became ferromagnetic at about 350°C, because the M2T40 values of the char derived from the asphaltene with the active catalysts after cooling to room temp. were over 250 kHz2, compared to typical values of 150 kHz2 for chars without ferromagnetic material. Hydrodesulfurization and hydrocracking with the catalysts were correlated with the values of M2T16 at 400°C. Moderate interaction of the metal oxide with the support material resulted in an intermediate redn. state with high HDS activity. The PMRTA method with 1H as a probe of the state of hydrocarbons such as asphaltene provides useful information about the catalyst activity and is helpful for the design and prepn. of the catalyst.