Synopsis of the PhD thesis entitled:

"Mesoporous catalysts of hydrodecyclization and isomerization of hydrocarbons"

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The aim of this study was to:

1) Identify the influence of the preparation conditions on the texture and morphology of mesoporous materials.

Study in this part of work included:

a) the influence of surfactant type on the properties of mesoporous materials

Cationic (quaternary ammonium bromides, DMPM-11 and M_2M-9) and sugar surfactants (decanol-N-methyl glucamide, MEGA); obtained in the Department of Organic and Pharmaceutical Technology in Faculty of Chemistry, Wroclaw University of Technology were used as a template in synthesis of silica materials. Nonionic ethoxylated alcohols with alkyl chains of different lengths and different number of ethoxy groups (commercially available under the trade name Rokanole) and ethoxylated castor oil (commercially available under the trade name Rokacety) were used in the synthesis of silica-alumina materials. The premise of this part of the research was to obtain mesoporous materials that are characterized by
a narrow pore distribution and high specific surface area (above1000 m 2 / g).

It has been shown that the materials synthesised with the DMPM-11, M_2M-9 MEGA are characterized by a narrow pore diameter and specific surface area less than 1000 m2 / g. From this materials, only material obtained with DMPM-11 as a surfactant has a texture similar to the SiSBA-15 materials. Materials obtained with Rokanol DB7 (7EO (C12 - C15), Rokanol T10 (8,5EO (C16 - C18)) Rokanol T6 (6EO (C16 - C18)), and Rokacet R40 (40EO-castor oil) have also a narrow pore diameter distribution and surface area greater than 1000 m2/ g. Among the materials synthesized with surfactants from PCC Rokita the greatest degree of arrangement had material synthesied with Rokanol T10.

b) the influence of synthesis method on porous materials properties (AlSBA-15 and AlMCM-41)

The aims of these research was to increase the degree of substitution of Si atoms with Al atoms in AlSBA-15 synthesized with aluminum sulfate and also to increase the pore diameter of AlSBA-15 materials synthesized with methylcellulose as co-template. In the typical synthesis conditions of MCM-41 NaOH is used for pH adjustment. It was assumed that the use of NH_4OH for pH adjustment will increase the acidity of the material, and that the change of pH regulator should not have a significant impact on the AlMCM-41 materials structure. The results showed that the modified method of synthesis allows to increase the incorporation of Al into the structure of AlSBA-15. The material obtained by the modified method of synthesis was characterized by about four times higher Si / Al ratios in comparison to the material prepared according to the procedure adopted in the present study as a standard procedure. It was also found that the introduction of methylcellulose during synthesis of AlSBA-15 increased the diameter of the pores. Materials obtained with the addition of methylcellulose had a less ordered structure. Material AlMCM-41 obtained with NH4OH was characterized by a higher acidity, larger specific surface area and also degree of arrangement was improved compared to AlMCM-41 obtained with using NaOH.

2) Determining the influence of the support on the activity and selectivity of platinum catalyst in the hydrogenation reaction (1-methylnaphthalene), and hydrodecyclization reaction (decalin)

AlSBA-15, ZrSBA-15, AlMCM-41, ZrMCM-41 and Al2O3 was used as a support in this part of research. Platinum catalysts obtained by using aluminum-containing supports (AlSBA-15, AlMCM-41) had a higher hydrogenating activity (greater selectivity of methyldecalin) than the catalysts prepared with use of supports containing zirconium (ZrSBA-15 ZrMCM-41). Also higher activity and selectivity to ring opening products had catalyst containing aluminum than catalyst containing zirconium.

3) Determining the influence of the support on the activity and selectivity of platinum catalyst in hydrocracking and isomerization reaction (n-hexadecane)

In this part of research, new materials prepared with ethoxylated alcohol (Rokanole), AlSBA-15 materials, SAPO-11, ZSM-22 microporous materials and micro-mesoporous material (containing AlSBA-15 and SAPO-11, designated as H-1) were used as a support of platinum catalysts. H-1 material was obtained by introduction of SAPO-11 during ALSB-15

synthesis.

In these study also catalysts obtained by mechanical mixing of the microporous catalysts (Pt/ AlSBA-15 + Pt/SAPO-11) and (Pt/AlSBA-15 + Pt/ZSM-22) was used in hydroconversion of n-hexadecane. The platinum catalysts that support was obtained with a Rokanole has a comparable activity and selectivity to isomerization products in n-hexadecane conversion as Pt/AlSBA-15catalysts.

It was found that the synthesis method of AlSBA-15 and alumina precursor used in AlSBA-15 synthesis affects platinum catalysts activity. The platinum catalyst obtained by using aluminum sulfate as a precursor had higher activity in n-C16 conversion than a catalyst prepared with aluminum isopropoxide. Platinum catalysts obtained with materials that was synthesised with ethoxylated alcohols (Rokanol DB7 and Rokanol T10) had higher activity in n-C16 conversion when compared to the Pt/AlSBA-15 (synthesied with standard method). Platinum catalyst with micro-mesoporous (H-1) support had lower activity and comparable maximum isomerization yield to the Pt/AlSBA-15 catalyst (standard method synthesis). The activity of catalysts (Pt/AlSBA-15 + Pt/SAPO-11) and Pt/AlSBA-15 was comparable.