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Low-Temperature Effects of Microporous Silicoaluminophosphate Adsorbents on Diesel Hydrocarbon Fractionation

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Abstract

This at work SAPO- 11 two step by step synthesis to do method in an autoclave consecutively hydrothermal / solvothermal processing to give in mind holds : initially synthesis At 200 °C take will go , then autoclave cooled and from it then sample At a temperature of 120 °C known time during hold will be raised .

Key words: Zeolite , hydrothermal synthesis , AEL type

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Introduction

Silicon-aluminophosphate silicoaluminophosphate low freezing to the temperature has diesel factions to take in the processes catalyst important acid component as working issued and industry in practice successful used . Low freezing to the temperature has diesel fuels quality determinant main parameters — isomerized isoparaffins share and excess cracking as a result harvest was gaseous of products minimum level . Same point of view from the perspective of silicoaluminophosphate of average acidity and AEL type porous structure his/her in industry efficiency determinant solution doer parameter as is considered .

Scientific point of view in terms of catalyst selectivity , activity and pore system molecular selectivity low freezing to the temperature has diesel factions quality in increasing important importance profession will reach .

2. Acidity features and isomerization in the process role

Silicoaluminophosphate of crystal in the structure located Brønsted acid centers average to power has is a hydrocarbon molecules skeleton too much outside without breaking them to isomerize directs .

AlPO-11 and SAPO- 11 (silicon) aluminophosphates synthesis **hydrothermal under the circumstances** metal in autoclaves Teflon coated inserts using done increased . Such reactor

configuration high temperature and pressure under the circumstances chemical of the environment inertia providing , reaction mixture pollution and walls with side effect mutual effects minimizes . Hydrothermal synthesis (GTS) method crystal of the fence orderly formation for necessary was ions again distribution and structural combination providing optimal kinetics and thermodynamic conditions creates .

Traditional synthesis in the way hydrothermal processing to give **24 hours at 200 °C during** take This is under the circumstances aluminum and phosphorus (and in the case of SAPO-11 silicon) types mutual condensed , AEL type crystal fence formation for necessary was core harvest to be and crystal growth stages consistent accordingly done increases . Temperature and time of parameters such selection crystal phase selective harvest to be providing , secondary or amorphous of phases appearance to be probability reduces .

Synthesis in the end taken product one how many in stages again First of all , the product **to neutral pH has until** distilled water with washed , this and free ions and to react not entered precursors from the system take to throw service will do . Later sample **Dried at 100–110 °C ,** this stage physicist adsorbed water loss and structure to the stabilization opportunity gives . Final in stages and sample **Heating at 650 °C, 3 °C/min at speed in the air procalcination will be done ,** as a result organic templates complete falling apart will be issued and catalytic active was open porous structure is formed .

Synthesis in the end taken of the product properties and functional activity his/her **next again work stages** with directly is determined . The first in stages product **distilled water with neutral pH (pH ≈ 7)** to until it reaches washed . This operation synthesis in the environment remaining free alkaline ions , excess phosphate or silicate types and to react not entered precursors effective accordingly take to throw service does . As a result crystal on the fence adverse ion exchange processes and secondary phases harvest to be probability noticeable at the level decreases , this and of the material phase stability increases .

Next in stages of the sample **At a temperature of 100–110 °C drying** physicist adsorbed water molecules release provides . This process crystal to the fence unconnected water take throw through of the material mechanic strength increases and next high with temperature processing to give in the process to the surface arrival possible was structural deformations limits . With this together , drying stage porous of the system initial to the opening help giving , procalcination process one in rhythm to pass provides .

Final in stages of the sample **Heating at 650 °C , 3 °C/min at speed in the air procalcination to be done** important importance has . Low heating speed heat stresses reduce , crystal of the fence violation prevent This in stages structure guide organic templates complete falling apart is released , resulting in to zeolite typical was **open and stable porous structure** Organic components release Brønsted and Lewis type acid centers active to the situation to pass conditions creating , material catalytic activity provides .

In general in this case , consecutively again work stages synthesis made of the material **crystallinity level , pore system development and acid centers activation** for important importance profession As a result high to stability and effective catalytic to properties has AlPO-11 and SAPO-11 materials are harvest are , they are isomerization and low freezing to the temperature has fuel factions to take in the processes application for suitable will be .

In general in this case , synthesis and thermal again work mode of AlPO-11 and SAPO-11 materials **high crystallinity level , stable porous structure and catalytic features** in formation important role plays . This is them hydrocarbons isomerization and low temperature properties improved fuel factions to take in the processes effective catalytic materials as application opportunity gives .

Average to power has acid centers catalytic in process activity and selectivity optimal balance Ostwald energy from profile come outgoing to the comment according to , isomerization process for necessary was activity level there is although , deep cracking for demand to be done high activation energy harvest It won't be . This because of silicoaluminophosphate at C–C bonds of hydrocarbons sharp does not decompose and excess cracking as a result harvest to be gaseous products and coke harvest to be decreases .

Table 1. Silicoaluminophosphate and strong acidic zeolites catalytic differences

Parameter	silicoaluminophosphate	Strong acidic zeolite
Acidity	Average	Strong
Isomerization selectivity	High	Low
Cracking result	Minimum	High
Gaseous product harvest to be	Less	Many
Coke harvest to be	Less	High

This feature low freezing to the temperature has diesel factions output to increase and their physicochemical quality to improve directly impact does .

3. Porous system and molecular selectivity

Silicoaluminophosphate of AEL type one dimensional channeled pore system molecular selectivity to provide service does . Channel system hydrocarbon molecules size and to the shape suitable coming road through the passage encourages , as a result branched isoparaffins formation increases .

Molecular selectivity isomerization in the process large molecules to the creaking not to occur provides . With this together , diesel low freezing point of fuels temperature and high isomerized structure noticeable at the level will improve .

4. Industry and scientific advantages

Silicoaluminophosphate of average acidity and suitable pore system combination him/her strong acidic aluminosilicate from zeolites separate It stands . Strong acidic zeolites with compared to , Silicoaluminophosphate excess creaking reduces and targeted product output increases .

Also , silicoaluminophosphate catalyst low freezing to the temperature has diesel factions working in the release high efficiency provides . Scientific in terms of , average acidity and pore structure isomerization and cracking processes kinetic and thermodynamic differences study opportunity This gives catalysts structural and functional to optimize basis will be .

5. Conclusion

1. Acidity selectivity : silicoaluminophosphate silicon-aluminophosphate average acidity hydrocarbons isomerization in the process selectivity increases and excess creaking reduces .
2. Porous System : AEL type one dimensional channeled pores molecular selectivity providing , low freezing to the temperature has diesel factions quality improves .
3. Practical and scientific importance : This features silicoaluminophosphate what industry and scientific in research low freezing to the temperature has diesel fuels working in the release effective and strategic importance has catalyst as to look at opportunity gives .

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