PENGARUH WAKTU HIDROTERMAL TERHADAP UKURAN PORI ZEOLIT HASIL MODIFIKASI

Oleh:

Ahmad Anwaril Fajari

J2C001127

RINGKASAN

Zeolit alam merupakan material berpori yang multiguna dengan luas permukaan cukup besar dan termasuk dalam kelompok material mikropori. Pemanfaatan zeolit alam selama ini belum optimal khususnya pada adsorpsi senyawa/molekul dengan ukuran lebih besar 20 Å sehingga zeolit alam perlu dilakukan modifikasi pada ukuran porinya. Upaya untuk memodifikasi ukuran pori zeolit salah satunya dapat dilakukan melalui metode resintesis. Penyusunan kembali struktur zeolit dan pembentukan inti kristal terjadi melalui proses hidrotermal. Dengan melakukan variasi waktu hidrotermal diharapkan akan berpengaruh terhadap ukuran pori zeolit hasil modifikasi.

Modifikasi zeolit alam dengan metode resintesis dilakukan melalui destruksi yang menghasilkan supernatan, kemudian dilakukan penambahan molekul pengarah hingga terbentuk gel dan dilakukan proses hidrotermal. Waktu hidrotermal divariasi untuk melihat pengaruhnya terhadap ukuran pori, luas permukaan, volume zeolit dan kristalinitas zeolit. Selanjutnya dilakukan proses kalsinasi yang bertujuan untuk mendekomposisi molekul pengarah dan memantapkan kerangka zeolit. Keberadaan molekul pengarah dapat dianalisis dengan spektrofotometri infra merah, kristalinitas zeolit hasil modifikasi diketahui dengan difraksi sinar-X, sedangkan ukuran pori dan luas permukaan pori ditentukan dengan metode adsorpsi gas nitrogen melalui persamaan BET.

Hasil analisis XRD dan spektrofotometri infra merah menunjukkan bahwa zeolit hasil modifikasi merupakan padatan kristal dan kandungan molekul pengarah dalam zeolit telah berkurang. Ukuran pori zeolit hasil modifikasi berdasarkan analisis BET adalah 26,05 Å untuk ZH-1, 31,49 Å untuk ZH-2 dan 25,67 Å untuk ZH-3 yang semuanya lebih besar dari ukuran pori zeolit alam sebesar 16,20 Å. Luas permukaan dan volume zeolit optimum terjadi pada ZH-2 yaitu secara berturut-turut 54,51 m^2/g dan 85,81 cm^3/g. Dari penelitian ini dapat disimpulkan bahwa waktu hidrotermal optimum untuk sintesis material zat padat adalah dua hari.

SUMMARY

Natural zeolite are porous materials which multi function with large enough surface area and included in-group of micro porous materials. Recently the exploitation of natural zeolite for has not been optimal especially to adsorp compounds/molecules bigger than 20Å therefore natural zeolite should be modified zeolite pore sizes. One way to modify zeolite pore size can be done through resynthesis method. Rearrangement of zeolite structure and forming of crystal nucleus is through a process of hydrothermal. It is expected by conducting variation of hydrothermal time will have an effect on pore size of zeolite result of modification.

Natural zeolite modification with resynthesis method was carried through destruction to produce of supernatants, then added by director molecules until it formed a gel and hydrothermal process was done. The variation of hydrothermal time to know the influence of pore size, surface area, volume of zeolite and crystallinity of zeolite. The following step was calcinations process which aims to decompose director molecules and settling of zeolite structure framework. The existence of director molecules was characterized using Infrared spectroscopy, the zeolite crystallinity was characterized using XRD, while pore size and surface area of zeolite were determined using nitrogen gas method adsorption through equation of BET.

The result of analysis XRD and infrared spectroscopy indicated that zeolite result of modification representing crystalline solid and director molecules content in zeolite have decreased. Pore size of the zeolite modification based on analysis of BET were 26.05 ?, 31.49 ? and 25.67 ? for ZH-1, ZH-2 and ZH-3 respectively which was bigger than natural zeolite pore size that was 16.20 ?. ZH-2 had optimum surface area and volume of zeolite that were 54.51 m^2/g and 85.81 cm^3/g for the later. From this research concluded that two days would be the optimum hydrothermal time for synthesis of solid material.

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