

Kinerja katalis praseodimium oksida/alumina untuk meningkatkan bilangan oktan bensin = performance of praseodymium oxide/alumina catalyst to increase the gasoline octane number

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Abstrak

Katalis Praseodimium oksida/alumina ($\text{PrO}_2/\text{Al}_2\text{O}_3$) dengan variasi kandungan praseodimium (0,01 - 0,03 % (b/b)) dipreparasi secara dry-impregnation menggunakan larutan garam $\text{Pr}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ pada penyangga $-\text{Al}_2\text{O}_3$. Katalis $\text{PrO}_2/\text{Al}_2\text{O}_3$ diuji aktivitasnya untuk meningkatkan bilangan oktan bensin. Reaksi dilakukan dalam reaktor batch berpengaduk pada tekanan atmosferik dan suhu 40°C dengan waktu bervariasi 20, 50, dan 80 menit. Katalis $\text{PrO}_2/\text{Al}_2\text{O}_3$ menunjukkan keaktifan dalam menaikkan bilangan oktan. Katalis yang dihasilkan dikarakterisasi dengan BET, ICPS, dan SEM-EDX. Kenaikan bilangan oktana bensin dianalisis menggunakan octane meter. Dari hasil octane-meter diketahui peningkatan bilangan oktan bensin tertinggi sebesar 1,9 dengan menggunakan katalis 0,03% $\text{PrO}_2/\text{Al}_2\text{O}_3$. Berdasarkan GC-MS, kenaikan bilangan oktan bensin dianalisis melalui % peak area masing-masing senyawa C8 hidrokarbon bercabang dan benzena sebesar 4,39 dan 26,08% berbanding dengan 4,16 dan 24,06% untuk bensin komersial. Bilangan oktan meningkat dengan penambahan prosentase praseodimium dalam katalis, namun tidak dipengaruhi waktu reaksi. Metode dry-impregnation berhasil dilakukan terbukti dengan terjadinya penurunan luas permukaan katalis seiring penambahan praseodimium. SEM menunjukkan adanya praseodimium di permukaan alumina, sedangkan analisis EDX dan ICPS mengidentifikasi adanya kandungan aluminium yang menurun sesuai dengan penambahan praseodimium.

.....Praseodimium oxide/alumina oxide ($\text{PrO}_2/\text{Al}_2\text{O}_3$) Catalyst with various compositions of PrO_2 (0,01-0,03 wt%) are prepared by dry-impregnation using salt solution $\text{Pr}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ and $-\text{Al}_2\text{O}_3$ as support. The activeness of Catalyst $\text{PrO}_2/\text{Al}_2\text{O}_3$ is tested to increase gasoline octane number. This reaction is done in stirred reactor batch at atmospheric pressure and temperature around 40°C with time variations of 20, 50, and 80 minutes. $\text{PrO}_2/\text{Al}_2\text{O}_3$ catalyst shows the activeness in increasing octane number. Catalyst is characterized using BET, ICPS, and SEM-EDX methods. Gasoline is analyzed using octane meter and GC-MS. From the result of octane meter, it shows the increasing of gasoline octane number, which used 0,03% $\text{PrO}_2/\text{Al}_2\text{O}_3$ catalyst showed the highest octane number increase up to 1,9. Besides that, the increasing of octane number is analyzed through the increase of %peak area of iso-octane and benzene compound from GC-MS as 4,39 and 26,08 respectively compared to 4,16 and 24,06% of commercial gasoline. Octane number increase with the increment of praseodimium percentages in catalyst, but it doesn't influent the reaction time. Dry- impregnation method is successfully done proofed by the reduction of catalyst surface area with the increment of Praseodymium. SEM shows that the existing of PrO_2 on Al_2O_3 surface, but the EDX and ICPS analysis identify the decreasing of aluminium composition with the increment of praseodymium.