

SINTESIS 2-(2-FURILMETILIDEN)SIKLOPENTANON DAN 2,5-BIS(2-FURILMETILIDEN)SIKLOPENTANON DENGAN MENGUNAKAN La_2O_3 SEBAGAI KATALIS

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INTISARI

Sintesis 2-(2-furilmetiliden)siklopentanon (FCP) dan 2,5-bis(2-furilmetiliden)siklopentanon (F_2CP) melalui reaksi kondensasi aldol telah berhasil dilakukan menggunakan katalis La_2O_3 yang telah dipreparasi. Penelitian ini bertujuan untuk melakukan preparasi katalis La_2O_3 melalui metode presipitasi, menganalisis stabilitas La_2O_3 sebagai katalis reaksi kondensasi aldol, melakukan sintesis senyawa FCP dan F_2CP serta menentukan kondisi optimum reaksi kondensasi aldol yang terkatalisis La_2O_3 . La_2O_3 merupakan katalis heterogen yang bersifat basa kuat sehingga berpotensi untuk menggantikan katalis homogen yang banyak digunakan pada reaksi kondensasi aldol sebelumnya.

Pada tahap preparasi La_2O_3 secara presipitasi, La_2O_3 dilarutkan dalam HNO_3 dan akuades dan ditambahkan NaOH hingga mencapai pH 12. Padatan yang terbentuk disaring dan dicuci hingga mencapai pH netral. Padatan La_2O_3 dikeringkan dan dikalsinasi pada suhu $650\text{ }^\circ\text{C}$ selama 3 jam. Katalis yang diperoleh dianalisis dengan FT-IR dan XRD. La_2O_3 yang terbentuk digunakan sebagai katalis dalam reaksi kondensasi aldol antara furfural (F) dan siklopentanon (CP). Reaksi dilakukan dengan variasi rasio reaktan, jumlah katalis, suhu dan waktu reaksi. Produk berupa F_2CP dan FCP yang dihasilkan dianalisis dengan GC-MS. Stabilitas katalis diuji dengan menganalisis produk yang dihasilkan dari penggunaan ulang katalis pada berbagai kondisi perlakuan. Berdasarkan hasil penelitian, diperoleh persentase total FCP dan F_2CP sebesar 83,793% dari reaksi dengan rasio F:CP = 1:4 mmol pada suhu reaksi $80\text{ }^\circ\text{C}$ selama 3 jam yang dikatalisis oleh 0,5 mmol La_2O_3 . Aktivitas La_2O_3 pada reaksi kondensasi aldol setelah reaksi dapat dipulihkan setelah katalis dikalsinasi pada suhu $650\text{ }^\circ\text{C}$.

Kata kunci: furfural, kondensasi aldol, La_2O_3 , presipitasi, siklopentanon.

SYNTHESIS OF 2-(2-FURYLMETHYLIDENE)- CYCLOPENTANONE AND 2,5-BIS(2FURYLMETHYLIDENE) CYCLOPENTANONE USING La_2O_3 AS A CATALYST

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ABSTRACT

Synthesis of 2-(2-furylmethylidene)cyclopentanone (FCP) and 2,5-bis(2-furylmethylidene)cyclopentanone (F_2CP) through aldol condensation reaction has been successfully carried out using prepared La_2O_3 as a catalyst. The purposes of this study were to prepare La_2O_3 catalyst through the precipitation method, to analyze the stability of La_2O_3 as a catalyst on the aldol condensation reaction, to synthesis FCP and F_2CP and determine the optimum conditions for the aldol condensation reaction catalyzed by La_2O_3 . La_2O_3 is one of the heterogeneous catalyst which has a strong basicity that potential to replace the homogeneous catalyst that widely used in the previous aldol condensation reaction.

The La_2O_3 catalyst was prepared using precipitation method. Lanthanum oxide (La_2O_3) was dissolved in HNO_3 and distilled water and NaOH was added dropwise until it reached pH 12. The formed solid was filtered and washed until it reached neutral pH. The La_2O_3 solid was dried and calcined at $650\text{ }^\circ\text{C}$ for 3 hours. The catalysts obtained were analyzed by FT-IR and XRD. The La_2O_3 solid was used as a catalyst in the aldol condensation reaction between furfural (F) and cyclopentanone (CP). The reaction was carried out with a variation of reactant ratio, reaction temperature, catalyst amount and reaction time. The F_2CP and FCP products were analyzed by GC-MS. The stability of the catalyst was also studied. Based on the research results, the total product percentage of FCP and F_2CP was 83.793% of the reaction with the ratio of F:CP = 1:4 mmol at a reaction temperature of $80\text{ }^\circ\text{C}$ for 3 h with the catalyst load of 0,5 mmol. The performance of La_2O_3 in the aldol condensation reaction regained after the spend catalyst was calcined at $650\text{ }^\circ\text{C}$.

Key words: aldol condensation, cyclopentanone, furfural, La_2O_3 , precipitation.