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Effect of hydrogen on catalytic activity of ziegler-natta catalysts prepared by different methods in ethylene polymerization

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Ethylene homopolymerization by two types of Ziegler-Natta catalysts including none-THF and none-EtOH catalysts was compared. The influences of hydrogen concentrations on surface active sites of these catalysts were investigated based on catalytic activity. From the results, the EDX analysis and surface area measurement confirmed that none-EtOH catalyst had better active center distribution than that of none-THF. Thus, the none-EtOH catalyst could retard the hydrogen effect on surface active sites and show higher activity with increased hydrogen pressures¹. However, catalytic activity was lower with high hydrogen pressure. In addition, to study for more detail about the hydrogen effect, none-THFs were modified with different metal halide additives (AlCl_3 and FeCl_2). Lewis acid modification can improve activity because it can remove the remaining THF in the final catalyst, which can poison the catalyst active sites via the ring-opening of THF² which was confirmed by FT-IR and XRD measurements. Moreover, the activity enhancement was due to the formation of acidic sites by modifying the catalysts with Lewis acids. Thus, FeCl_2 doped catalyst (Fe-THF) exhibited the highest activity followed by AlCl_3 doped catalyst (Al-THF) and undoped catalyst (ZN-THF). In the $\text{H}_2/\text{C}_2\text{H}_4$ molar ratio of 0.08, Fe-THF showed a better hydrogen response on the surface active sites than Al-THF due to more titanium clustered distribution. Fe-THF is considered to have more clustered Ti species than Al-THF³. As a consequence, it led to obtain more possible chances to proceed chain transfer reaction by hydrogen.

Biography

Thanyathon studies the doctoral degree of chemical engineering at chulalongkorn university and joined catalysis and catalytic reaction engineering research group with the Royal Golden Jubilee program of Thailand Research Fund (TRF).

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