

ゼオライト溶解ゲル骨格補強法を用いて調製した新しい階層構造触媒による LDPE の接触分解反応

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Catalytic cracking of LDPE using novel hierarchical catalyst prepared by zeolite-dissolving gel skeletal reinforcement method (*Graduate School of Engineering, Mie University¹, Mie Prefecture Industrial Research Institute Ceramic Science Branch²*) Shunma Mitsuka¹, Shuma Tanaka¹, Rino Nakajima¹, Shinya Matsuura², Tadanori Hashimoto¹, ○Atsushi Ishihara¹

A zeolite-dissolving gel skeletal reinforcement method was investigated to prepare a hierarchically structured catalyst in which mesopore silica was formed around the zeolite by mixing and heating the mixture composed of zeolite and a gel skeletal reinforcing reagent of hexamethyldisiloxane-acetic anhydride. From the results of XRD measurements, it was confirmed that when the treating temperature was the same and the processing time was extended, mesopores developed. From the results of nitrogen adsorption and desorption measurements, it was found that when the processing temperature was high and the treatment time was long, the micropores decreased and the mesopores developed. As a result of investigating catalytic cracking of low-density polyethylene using the Curie Point Pyrolyzer method,¹⁾ it was confirmed that when a catalyst prepared at the same treatment temperature had a long treatment time, the catalyst had mesopores and showed the improved activity. Among the catalysts examined, the highest conversion of 57% was shown for the catalysts of 200 (72h).
Keywords : Zeolite-dissolving gel skeletal reinforcement; Hierarchical catalyst; Catalytic cracking; Low-density polyethylene; Curie point pyrolyzer

ゼオライトとヘキサメチルジシロキサンー無水酢酸から成るゲル骨格補強剤を混合・加熱することにより、ゼオライトの周囲にメソ孔シリカを形成させた階層構造触媒を調製するゼオライト溶解ゲル骨格補強法を検討した。XRD 測定の結果から、処理温度が同じ場合、処理時間を延長するとメソ孔が発達したことが分かった。窒素吸脱着測定の結果から、処理温度が高く、処理時間が長い場合に、ミクロ孔が減少し、メソ孔が発達することが分かった。低密度ポリエチレンの接触分解をキュリー・ポイント・パイロライザー法で検討した結果、同じ処理温度で調製した触媒では処理時間が長く、メソ孔が発達した触媒を用いた場合に転化率の向上が確認できた。検討した触媒の中で、200(72h)の触媒で最も高い 57% の転化率を示した。

1) Effect of Silica-Alumina Ratio on Catalytic Cracking of Polyethylene over Mesoporous Silica-Zeolite Hierarchical Catalysts Produced by Gel Skeletal Reinforcement, T. Yoshimura, A. Ishihara, et al., *Energy Fuels* **2025** in press, <https://doi.org/10.1021/acs.energyfuels.4c04786>.

2) Estimation of catalytic cracking of vacuum gas oil by ZSM-5- and β -zeolite-containing two-layered and novel three-layered hierarchical catalysts using Curie point pyrolyzer, T. Yoshimura, A. Ishihara, et al., *J. Anal. Appl. Pyrol.* **2024**, 182, 106621, <https://doi.org/10.1016/j.jaap.2024.106621>.