

수소동위원소 교환반응용 소수성 촉매의 특성 비교
Characterization of Hydrophobic Catalysts for Hydrogen Isotope Exchange

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요 약

수소동위원소 분리를 위한 액상촉매교환공정용 국산 소수성 촉매인 KC-1 및 KC-2의 특성을 일본의 Fugen 중수승급기에 사용되고 있는 일본산 Kogel 촉매와 비교하였다. 국산 소수성 촉매의 성능검증을 위해 캐나다 AECL에 의뢰하여 촉매의 기공분포, 비표면적, 백금함량 및 분산도 등을 측정하고 국내에서 측정하고 있는 값과 일치하였다. KC-1, KC-2의 모양은 Pellet형이고 크기는 4×4mm이며, Kogel 촉매는 4~5.5mm의 구형으로 이들의 백금함량은 모두 0.8wt%였다. KC-1, KC-2, Kogel 촉매의 BET 표면적은 각각 442, 247, 514m²·g⁻¹으로 KC-2가 낮게 나타났으며, 백금면적은 각각 2.47, 2.07, 1.90 m²·g⁻¹, 백금분산도는 100, 100, 92%로 KC-1과 KC-2가 Kogel 촉매보다 높게 나타났다. 평균기공의 크기는 KC-2가 다른 두 촉매보다 컸다.

Abstract

Domestic hydrophobic catalysts, KC-1 and KC-2, which were developed for the liquid phase catalytic exchange process separating hydrogen isotopes, were tested against Japanese catalyst, Kogel, which is being used in the Fugen's heavy water upgrader in Japan. KC-1 and KC-2 have different characteristics due to the differences of the solvent and solvent composition used. The test results of domestic hydrophobic catalysts characteristics such as pore distribution, specific surface area, platinum loading, and platinum dispersion from AECL agreed well with the results obtained by KEPRI/KAERI. The shape of KC-1 and KC-2 were 4×4 mm cylindrical pellet and that of Kogel catalyst was 4~5.5mm sphere. The platinum loading of all catalysts were 0.8 wt%. The BET surface areas were 442, 247, 514m²·g⁻¹ for KC-1, KC-2, and Kogel respectively, among which the BET surface area of KC-2 was the smallest. The platinum dispersion area was 2.47, 2.07, 1.90 m²·g⁻¹ and the platinum dispersion was 100, 100, 92% for KC-1, KC-2, and Kogel respectively, which showed domestic catalysts had higher values than Kogel catalyst. The average pore size was the largest in KC-2.