D-5 유동층 공정에서 건식 재생 흡착제의 이산화탄소 흡착 거동 연구

CO_2 Adsorption Behaviors of Dry Regenerable Sorbents Using Fluidized Reactor

이용로, 안영수*, 조철희*, 조성호*, 김희택
한양대학교 화학공학과
*한국에너지기술연구원

K_2CO_3, γ-Al_2O_3를 주원료로 하고, 무기결합제, 유기결합제, 분산제, 소포제 등을 사용하여 분무건조법으로 K_2CO_3-Al_2O_3 과립입자를 합성하였다. 합성된 K_2CO_3-Al_2O_3 과립입자는 공기 분위기에서 550°C, 650°C, 750°C에서 각각 3시간 하소하여 유기물을 제거하고 강도를 부여하였다. 하소된 K_2CO_3-Al_2O_3 과립입자의 유동층 공정 적용 가능성은 기초 특성 평가를 통해 이루어졌다. 하소된 K_2CO_3-Al_2O_3 과립입자는 10%CO_2-7%H_2O-N_2 balance 혼합가스를 이용하여 내경 5 cm, 직경 8 cm의 기포 유동층 반응기로 CO_2 흡착 성능을 평가하였고, 150°C에서 N_2로 재생능력을 알아보았다. 본 연구에서는 분무건조용 슬러리의 조성, 하소 조건, 그리고 흡착 성능 평가 시 전 처리 조건, 유속, 반응온도가 K_2CO_3-Al_2O_3 과립입자의 CO_2 흡착 성능에 미치는 영향을 고찰하였다.

D-6 Effect of Li Stoichiometry on the Electrochemical Performance of $Li_{1+x}Ni_{0.5}Mn_{0.5}O_{2+y}$ Cathode Materials

O. A. Shlyakhtin*,, Sun Hee Choi*, A. V. Knotko**, Joosun Kim*, Young Soo Yoon***, and Young-Jei Oh***
*Korea Institute of Science and Technology
**Department of Chemistry, Moscow State University
***Department of Advanced Fusion Technology, Konkuk University

Introduction of superstoichiometric lithium during synthesis of $Li(Ni_{0.5}Mn_{0.5})O_2$ cathode materials for Li-ion batteries results in increase of reversible electrochemical capacity to 180–190 mAh/g. This effect is attributed to the formation of new solid solutions $Li_{1+x}(Ni_{0.5}Mn_{0.5})O_{2+y}$ ($0 \le x \le 0.5$) with hexagonal structure, close to $Li(Ni_{0.5}Mn_{0.5})O_2$. Increase of Li content is accompanied by non-monotonous increase of Ni oxidation state, evaluated by XPS. Rietveld refinement of XRD pattern profiles confirmed the allocation of extra lithium in the regular B-sites of ABO_2 lattice. Significant cationic antisite disorder, usually observed in the stoichiometric $Li(Ni_{0.5}Mn_{0.5})O_2$, decreases systematically with x.

D-7 The Effect of Oxygen Partial Pressure on the Electrical Conductivity of Calcium Zirconate

Soon Cheol Hwang*, and Gyeong Man Choi***
*Department of Materials Science and Engineering, Pohang University of Science and Technology
**Research Institute of Industrial Science & Technology

Calcium zirconate with a perovskite structure has the high thermal and chemical stability, and the good thermal shock resistance. It has been used as a refractory material, a microwave dielectric, a solid electrolyte, and a proton conductor. However, there are still controversies regarding to the electrical conductivity as a function of nonstoichiometry and oxygen partial pressure (Po_2). In this study, the electrical conductivities of $Ca_{1-x}ZrO_{3-\delta}$ ($0 \le x \le 0.1$) systems were measured as a function of Ca/Zr ratio, temperature and oxygen partial pressure by using impedance spectroscopy at temperatures between 700°C and 1100°C. The total conductivity of stoichiometric $CaZrO_3$ was proportional to $Po_2^{1/4}$ in high Po_2 and it was Po_2 independent in intermediate region. With decreasing Po_2, both the grain and grain boundary conductivity rapidly decreased in low Po_2 region.

D-8 Development of Tin Oxide/Carbon Aerogel Composite Electrodes for Supercapacitor Applications

Sung Woo Hwang, Sang Hoon Hyun, and Kang Ho Lee*
Dept. of Ceramic Eng., Yonsei University
*Dandan Coporation

SnO_2/carbon aerogel nanocomposite electrodes have been synthesized via direct sol impregnation of SnO_2 sol into RF wet gel structures. Since the high conductivity and excellent pseudo-capacitive property of tin oxide for electrochemical capacitors, it was selected as an additive material in carbon aerogel to combine the advantages of tin oxide and carbon aerogels for supercapacitor application. SnO_2 sol-impregnated RF wet gels were ambiently-dried at R.T~50°C after exchanging the solvents. Carbon aerogel/tin oxide composite aerogels were prepared by pyrolyzing RF aerogels under nitrogen flow in a tube furnace. The specific capacitance of tin oxide/carbon aerogel composite electrodes increased up to 320 F/g, and the other effects of tin oxide addition on the physical/electrochemical properties of carbon aerogel have been experimentally elucidated.