Adsorption Characteristics of Nitrogen and Oxygen onto Ion-exchanged X-type Zeolite

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Adsorption characteristics of nitrogen and oxygen onto the ion-exchanged X-type zeolites through pressure swing adsorption (PSA) process were investigated. On the basis of Na-X zeolite, a series of ion-exchanged X-type zeolites containing Ag, Li, Ca, Sr, Br, and K were prepared and investigated in this work. It was revealed that the ion-exchanged X-type zeolites showed a remarkably improved and selective adsorption capability for nitrogen. At equilibrium pressure under 0.5 atm, adsorption capability for nitrogen was decreased in the order of Ag-X > Li-X > Sr-X > Ca-X > Na-X > Ba-X > K-X. At equilibrium pressure over 1 atm, however, the capability was decreased in the order of Li-X > Ag-X > Sr-X > Ca-X > Na-X > Ba-X > K-X. The Li-X zeolite exhibited the selective adsorption capability for nitrogen in the air separation process at high pressure. The separation factor for nitrogen/oxygen (= $\Delta N_2/\Delta O_2$) in the Li-X zeolite was ca. 13.