# Adsorption of $N_2$, $O_2$, $CO_2$ and $H_2$ on Hydrotalcite-Like System: $Mg^{2+}$-$Al^{3+}$-$(Fe(CN)_6)^{4-}$

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**Abstract:** The compound $Mg^{2+}$-$Al^{3+}$-$(Fe(CN)_6)^{4-}$, with a structure similar to hydrotalcite $Mg_6Al_2(OH)_{16}CO_3 \cdot 4H_2O$, is prepared by a coprecipitation method. Chemical, thermal, and X-ray analysis of the compound lead to the formula: $(Mg_{0.741}Al_{0.259}(OH)_2)((Fe^{II}(CN)_6)_{0.067}(CO_3)_{0.002}(H_2O)_{1.05})$

The compound is dehydrated at 100 ° to 250 ° C and the adsorption of $N_2$, $O_2$, $CO_2$, and $H_2$ on it is measured at −196 ° C to room temperature by the volumetric method. The water is removed reversibly from 100 ° to 200 ° C and the interstices after dehyration act as sites of adsorption. When dehydration is carried out at 150 ° C the adsorptive activity reaches a maximum. Adsorption isotherms of $N_2$ and $O_2$ at −196 ° C and of $CO_2$ at room temperature are of the Langmuir type, and the saturated amounts of $N_2$, $O_2$, and $CO_2$ adsorbed are 96.3, 65.2, and 91.8 ml (STP)/g, respectively.

Adsorption isotherms of $N_2$ and $O_2$ at room temperature are of the Henry type. The amount of $O_2$ adsorbed is about 67% of that of $N_2$. The isosteric heats of adsorption at room temperature of $N_2$, $O_2$, and $CO_2$ are 5.1, 4.8, and 11.0 kcal/mol, respectively. A dehydrated product of a $Mg^{2+}$-$Al^{2+}$-$CO_3^{2-}$ compound does not permit adsorption of $CO_2$ at room temperature, but permits the adsorption of $H_2O$. Hence, it has a molecular sieve effect. No adsorption of $H_2$ is observed in any of the compounds tested.

**Key Words:** Adsorption • Hydrotalcite • Isotherm • Surface • Zeolite

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