Intercalation of Graphite

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Introduction

The first intercalated compound, graphite sulfate, was described by Schauffaütl in 1841 [1]. However, it was only in the past decade that the value of these compounds has been discovered-namely, their application to superconductors, catalysts, and materials for batteries

Structure

Intercalation of graphite involves the penetration of guest species between the carbon layers with a consequent expansion of the graphite in the c-axis direction [2]. A three dimensional representation of C_8K is given in Figure 1 [3].

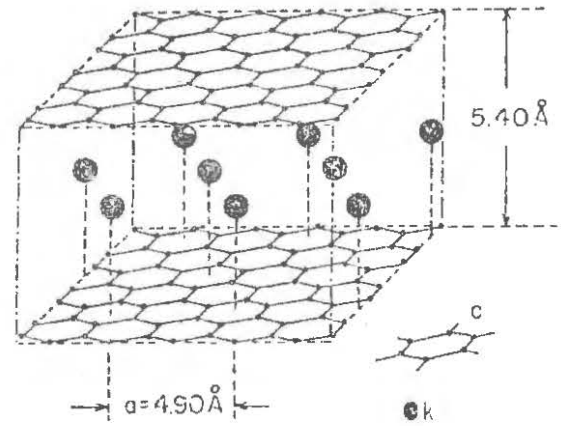

Figure 1

Synthesis

Various metal chloride-graphites can be prepared by the use of solvent techniques [4,5]. Metal-graphites can be prepared by the diffusion of the vapors of metals at reduced pressure or by the reduction of metal chloride-graphites with $LiAlH_4$, or $NaBH_4$ [6].

Catalysis

Potassium-graphite shows distinctive reducing properties and stereochemistry towards carbonyls [7].

Chromic anhydride-graphite offers a new selective method for preparation of aldehydes from the corresponding primary alcohol [7] An excellent review of the catalytic properties of alkali metal-graphite intercalation compounds has appeared recently and summarizes the state of the literature on this subject [8].

Kinetic Study

It has been recognized that NMR relaxation measurements are a powerful tool for the study of molecular dynamics. The number of studies of surface properties has, however, been relatively small. One of the reasons for this is that it has been difficult to observe spectra of small amounts of adsorbate in heterogeneous systems. Modern spectrometers are sufficiently sensitive to overcome this problem and may readily be used to measure relaxation times, line widths and chemical shifts of adsorbate nuclei. The study of chemical shifts may give information on the structure of the adsorbate, the variation of line widths and relaxation times together give information on the microscopic dynamic properties of the adsorbate. Riehl and Fisher reported relaxation measurements for H_2 adsorbed on graphite [9].

References

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