

Evaluation of cadmium hexacyanoferrate(III) as a microporous material

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Abstract

The properties of cadmium hexacyanoferrate(III), $\text{Cd}_3[\text{Fe}(\text{CN})_6]_2$, as a microporous material were evaluated from adsorption data of CO_2 , N_2 and water vapor. The adsorption isotherms were interpreted according to the Dubinin–Radushkevich and Dubinin–Astakhov models. The adsorbate–adsorbent interactions during the activation and the adsorption processes were monitored by XRD, IR and Mössbauer techniques where the adsorption of propanol, ethanol and diethyl ether was also considered. As a measure of the adsorbate–adsorbent interactions, calculations of the adsorption isosteric heats were also carried out. © 2002 Published by Elsevier Science Inc.

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1. Introduction

The microporous character of cyanometallates is known [1,2]. Their adsorption of gases and vapors can be explained considering that many compounds of this family have a open-channel structure, particularly those where the channels are formed by an array of structural vacancies in the complex, for example, $\text{M}_3^c[\text{M}^a(\text{CN})_6]_2$, where M^c and M^a are divalent and trivalent cations, respectively [3]. The use of some cyanometallates as molecular sieves has also been explored with promising results due to their flexibility to change both the geometry and dimensions of the pore size

varying the metal cations, the number of vacancies and even the ligand (e.g. NO or OH for CN) [4,5]. Compared to zeolites, where the exchangeable cations behave as strong charge centers, the internal surface in cyanometallates shows a less ionic character, which could facilitate the removing of adsorbed water at relatively low temperature.

Certain hexacyanometallates can also be used as ionic exchangers to recover valuable metals (e.g. silver) or to collect dangerous cations (e.g. radioactive cesium) from waste waters [6,7], applications where these complexes can replace the use of silica–alumina sorbents. The decomposition of ozone from gaseous effluents is another application where the microporous character of some hexacyanometallates becomes useful [8,9].

In spite of these possible applications of cyanometallates as microporous materials their study

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