Thermochimica Acta, 93 (1985) 433-434
Elsevier Science Publishers B.V., Amsterdam

GRAPHITE BISULPHATES THERMAL ANALYSIS

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ABSTRACT

A behaviour of graphite intercalation compounds (GIC's) with sulphuric acid, as well as products of their pyrolysis in different conditions was investigated by a set of thermal analysis methods.

INTRODUCTION

The last decade is characterized by an intesive development and investigation of a new type of graphite, i.e. thermally exfoliated graphite (-TEG), having a highly imperfect structure, which stipulates many of its unique properties. The most perspective raw material for TEG powders preparation for heat engineering are graphite bisulphates, which are the products of natural graphite electrochemical oxidation in concentrated sulphuric acid.

The aim of this paper is to conduct a thermal analysis of graphite bisulphates, having $C^{+}_{24}HSO^{-}_{4}\cdot 2,5H_2SO_4$ (the 1st stage), $C^{+}_{48}HSO^{-}_{4}\cdot 2,5H_2SO_4$ (the 2nd stage), $C^{+}_{96}HSO^{+}_{4}\cdot 2,5H_2SO_4$ (the 4th stage) composition, as well as to characterize the pyrolysis products in order to reveal a correlation between TEG properties and those of the raw material for its production.

EXPERIMENTAL AND DISCUSSION

Investigations of the above materials was carried out in vacuum, inert medium and in air with the heating rate 0.02-500 K/s.

We characterizied GIC's-H_2SO_4 thermal stability limits, a mechanism, kinetics and energetics of their linear pyrolysis, as well as bulk density, porosity, texture and specific surface of a carbon residue. We revealed regularities of environmental conditions influence on GIC thermodestruction process physico-chemical parameters and also on properties of a solid phase being formed. It was found

Proceedings of ICTA 85, Bratislava

out that depending on the sequence of carbon and intercalated component layers alternation, as well as on peculiarities of GIC's-H_2SO_4 pyrolysis process one can obtain TEG powders having a wide set of surface, electrophysical and thermophysical properties. We showed that by choosing conditions for forming compact products of TEG powders one can produce materials having different sets of heat-reflecting characteristics.

A conclusion is made on the existence of a definite correlation between graphite bisulphates properties and those of TEGs synthesized from them.