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MINERALOGICAL EXAMINATION OF LINGAN
COAL FROM NOVA SCOTIA

by
W. Petruk

Mineral Sciences Division

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SUMMARY OF RESULTS

Lingan coal from Nova Scotia was studied mineralogically to determine the mode of occurrence of sulphur. The sulphur occurs as a constituent of the organic material in coal (about 0.6 wt %); of pyrite in pyritic layers (20 wt % to 47 wt % S in each layer); and as finely disseminated pyrite grains in the coal near the pyritic layers (up to 0.08 wt % S).

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INTRODUCTION

Ten specimens of coal from Nova Scotia, labelled "Lingan coal" were received from Mr. A. Wall of the Mineral Processing Division on November 14, 1972. Mr. Wall stated that a multi-disciplinary study is being conducted in the Mines Branch on this coal and that he is investigating methods of removing the sulphur from it. The coal contains sulphur as a constituent of pyrite and of the organic material in the coal. Mr. Wall requested that the mode of occurrence of pyrite be determined.

Nine polished sections were prepared from the hand specimens and studied by ore microscopy, X-ray diffraction analysis, electron microprobe analysis, and quantitative image analysis.

RESULTS OF INVESTIGATION

Characteristics of the coal

Some of the coal has a brilliant lustre and some is dull. The dull variety contains small inclusions and veinlets of calcite, siderite, dolomite, and alumino-silicates. Microprobe studies indicate that the coal contains about 0.6 wt % S and no detectable iron (less than 0.05% Fe).

Mode of Occurrence of the Pyrite

Pyrite is present in pyrite layers; as disseminated grains near the pyritic layers; and as nearly sub-microscopic grains throughout the coal. The pyritic layers are 1 to 4 mm wide, have relatively sharp boundaries with the adjacent coal, and consist of 40 to 85 wt % pyrite and 15 to 60 wt % coal (mean of 6 layers = 75 wt % pyrite and 25 wt % coal). Size analysis of the pyrite grains in three different pyritic layers are given in Table 1. The quantity of pyrite occurring in pyritic layers cannot be determined

from the few specimens studied, but it is estimated to be greater than 1 wt % of the coal. In some specimens, the pyritic layers are 5 cm apart and, in other specimens, they are absent. Microprobe analyses show that the Co, Ni, and As content of the pyrite in these layers is non-detectable (i. e. less than 0.05% Ni 0.08% Co, and 0.1% As).

TABLE 1

Size Analyses of Pyrite Grains in Different
Pyritic Layers

Size (in microns)		Layer 1 Vol. %	Layer 2 Vol. %	Layer 3 Vol. %
<u>plus</u>	<u>minus</u>			
0	15	0	1	0
15	30	2	2	0
30	60	6	10	0
60	90	8	15	3
90	120	5	16	1
120	150	3	9	2
150	180	6	3	2
180	210	3	10	5
210	240	2	6	5
240	300	13	6	14
300	300	52	22	68
Total		100	100	100

The pyrite in coal adjacent to pyritic layers is as disseminated grains between 1 and 10 microns in diameter. Quantitative analysis shows that these account for 0.16 wt % of the coal.

Some nearly sub-microscopic disseminated grains smaller than 0.2 microns, believed to be pyrite, were found with the ore microscope. Microprobe analyses of areas containing these grains did not detect iron or sulphur; this suggests either that the quantity is below the limit of detection or that these grains are not pyrite.

CONCLUSIONS

1. The coal contains 0.6 wt % sulphur as a constituent of organic material in the coal, up to 0.08 wt % sulphur as a constituent of disseminated pyrite grains (1 to 10 microns) in coal, trace amounts of sulphur as a constituent of nearly sub-microscopic pyrite, and an undetermined amount of sulphur (up to several weight per cent) as a constituent of pyrite in pyritic layers.
2. Only the pyrite in the pyritic layers can be removed readily by mechanical means. It is expected that, after removal of this pyrite, the coal would still contain about 0.7 wt % sulphur.
3. The pyritic layers are about 1 to 4 mm wide and contain 40 to 85 wt % pyrite.

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