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PETROGRAPHIC STUDIES OF LIGNITE AND ITS RESIDUAL PRODUCT FROM LIQUEFACTION PROCESS

(An Interim Report)

B.N. Nandi

MAY 1979

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PETROGRAPHIC STUDIES OF LIGNITE AND ITS RESIDUAL
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by

B.N. Nandi

Beak Consultant Limited sent original lignite sample and 16 liquefaction residue samples to train one of their employees at the ERL to get acquainted with petrographical analysis of lignite macerals and microscopical examination of the residual hydrogenated solid product. Our group had devoted a considerable amount of time and effort to train Beak's employee for nearly three months on the following topics:

1. Preparation of samples of lignite, char and residual solid products of hydrogenation.
2. Identification of different types of macerals in lignite mainly numinite, enimite, resinite and fusinitic group.
3. Microscopical examination of different kinds of char and coke and to take micrographs

The following report is based on my studies of the samples forwarded by Beak Consultants. An attempt has been made to interpret the microscopic structure and micrographs obtained from these samples which had gone through various conditions during liquefaction and also to correlate the conversion of oil.

The data on this report and the results of this study should not be published (either in part or in whole) without the permission of the author because the probable inaccuracy in the interpretation owing to the author's lack of knowledge of this subject.

Sample Preparation

Most of the samples were prepared according to the ASTM Specifications. Some new techniques developed by our group were given to the Beak employee.

Microscopic Examination

Microscopic examinations were carried out in Leitz reflected PAN-POL PHOT microscope using oil immersion objective at a magnification of 600.

RESULTS

Results are given in Table 1.

CONCLUSION

The preliminary results and interpretation are very inconclusive. An attempt has been made to correlate the reactivity of this particular lignite under favourable conditions of liquefaction. It may be noted that low temperature and high promoting Co/H_2 prevents coke formation and gives a better yield of oil.

TABLE I

Run No.	Proportion CO/H ₂	Temperature K	Pressure MPa	Residence Time Minutes	Conversion %	Oil Yield %	Remarks
Original Lignite							See Figure 1 & 2
1	0.33/1	653	7.1	10	53	19	No coke was formed Remains of huminite as thin walled structure. Fig. 3 & 4
10	0.33/1	733	7.1	50	68	17	Formation of coke structure in the residue. Fig. 5 & 6
12	3/1	733	7.1	50	85	21	Coke was formed. Partial conversion taking place in some macerals. Fig. 7 & 8
8	3/1	733	11.1	10	84	42	Less coking formed because of short residence time. Fig. 9 & 10
15	3/1	653	11.1	50	83	52	Low temperature prevents the coke formation. Most macerals dissolved completely. The residue consists of inerts & partially oxidized huminite. Fig. 11 & 12.

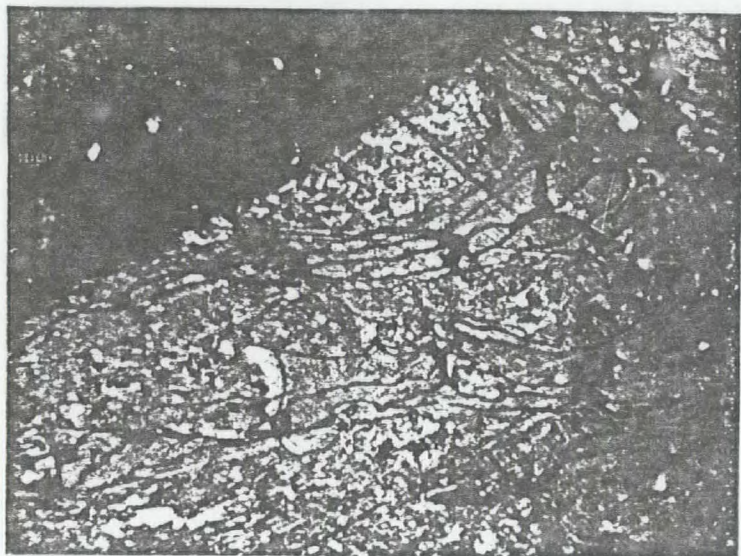


Figure 1

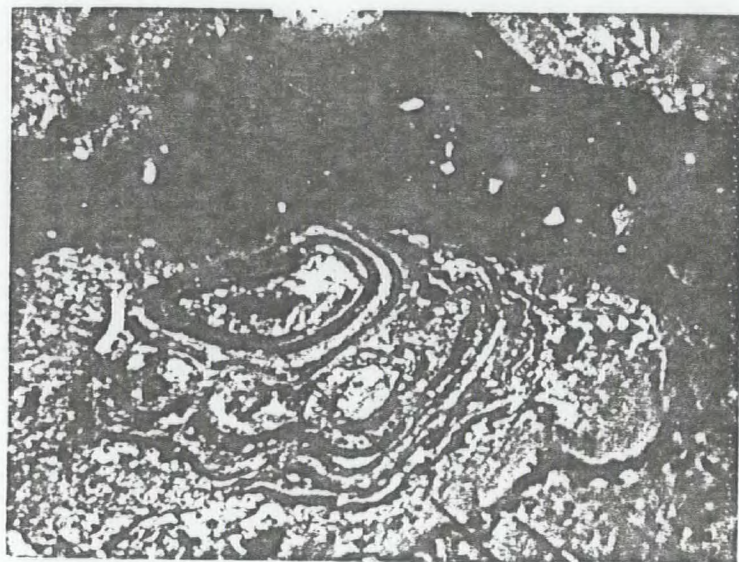


Figure 2



Figure 3

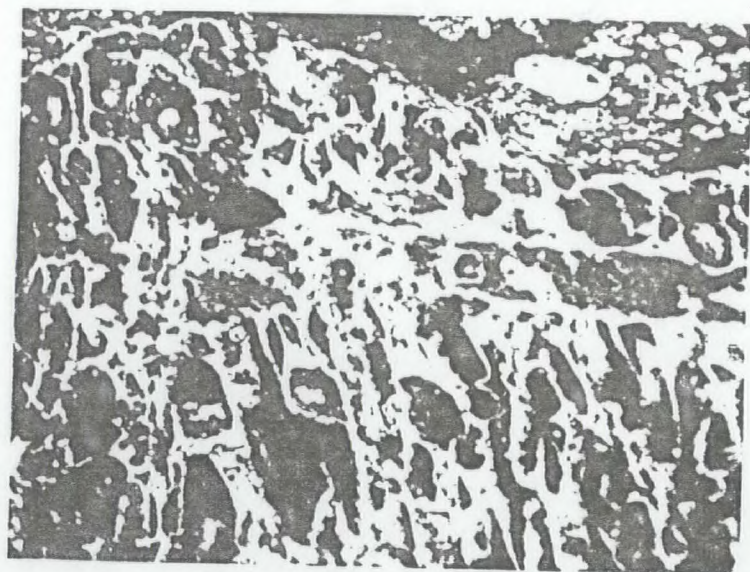


Figure 4

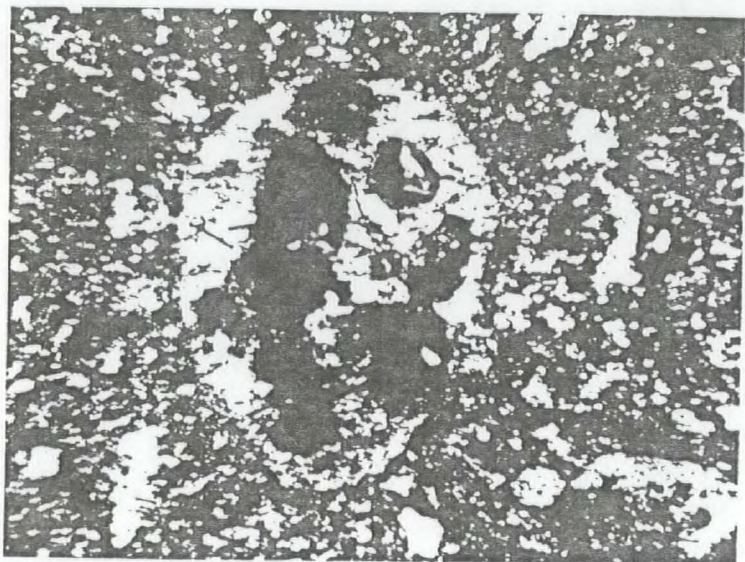


Figure 5

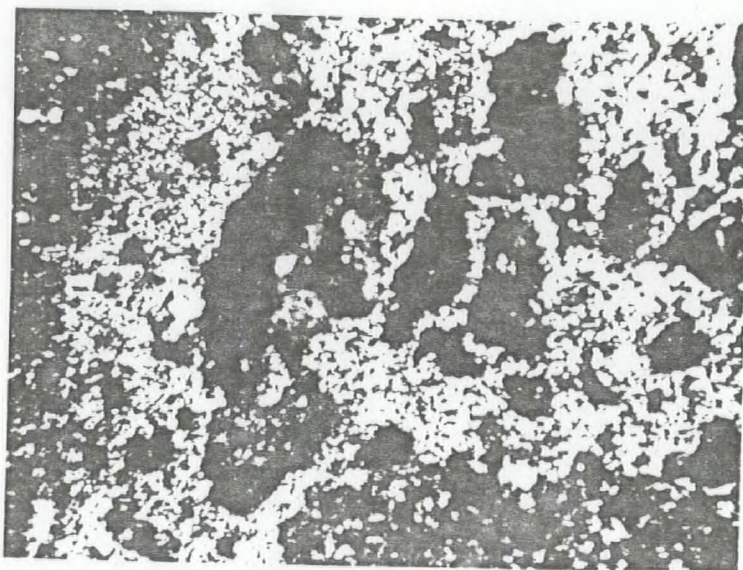


Figure 6

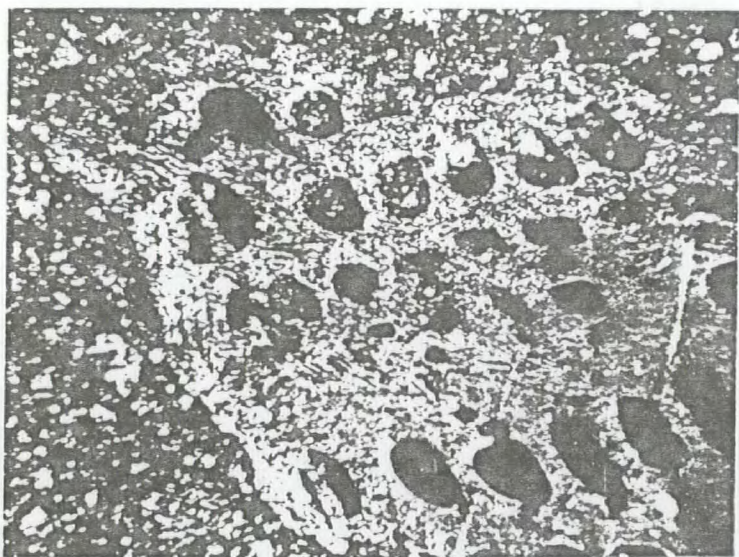


Figure 7

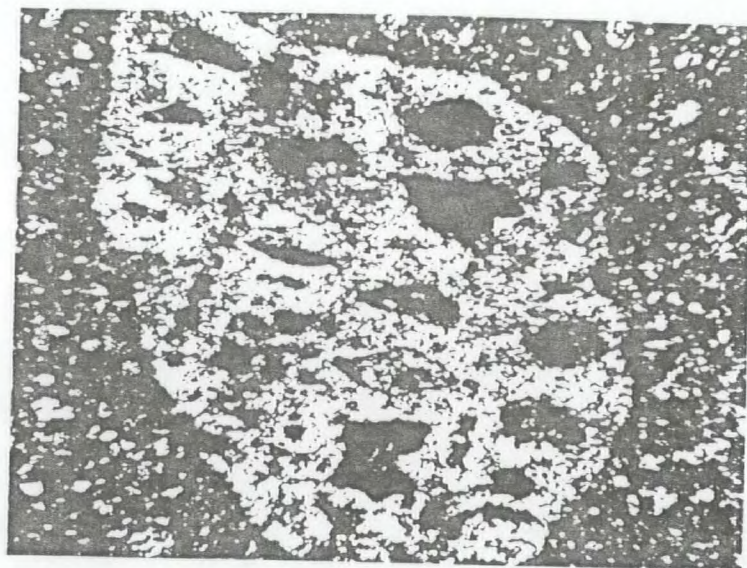


Figure 8



Figure 9

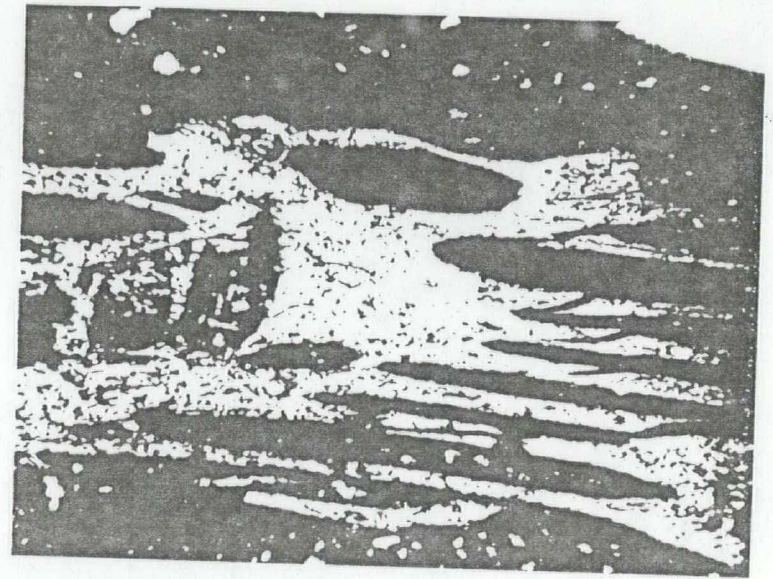


Figure 10

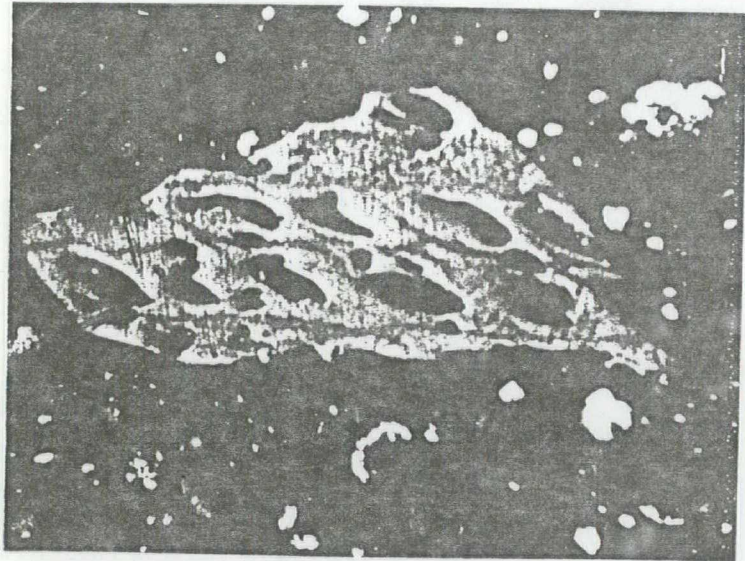


Figure 11

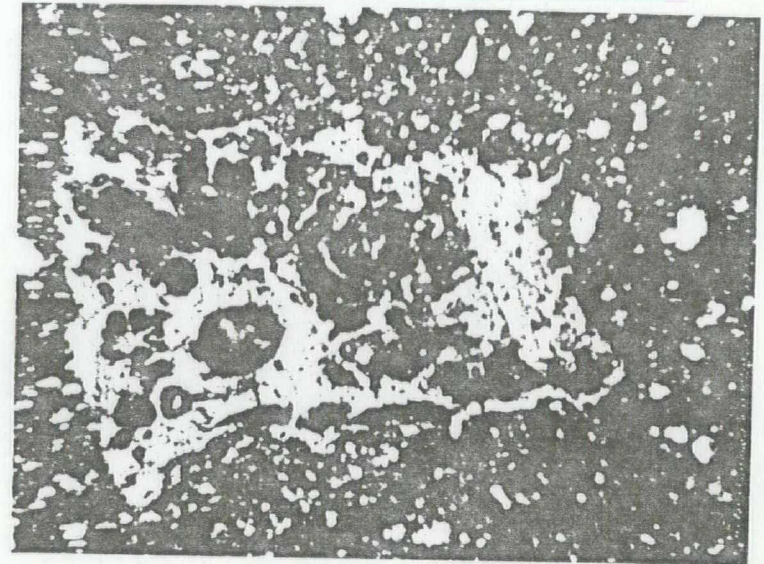


Figure 12