Thermochimica Acta, 103 (1986) 147—150
Elsevier Science Publishers B.V., Amsterdam — Printed in The Netherlands

INVESTIGATION OF DIFFUSIONAL PHENOMENON IN THE OIL SHALE OF TIMAHDIT(MOROCCO). ROLE OF SEDIMENTED PLANS.

L. BELKBIR, H. BARKIA
Laboratory of Reactivity of Solid/gas Systems. Department of Chemistry,
Faculty of Sciences. Rabat (MOROCCO).
N. GERARD
Laboratory of Research for the Reactivity of Solids.
Faculty of Sciences Mirande 21 000 Dijon (FRANCE).

SUMMARY

The pyrolysis of the organic material of Timahdit oil shale under an inert atmosphere has been realised to point out the role of both sedimented plan and profile concentration of organic material according to parallel and perpendicular orientation in relation to the sedimented plan. These concentration profiles have been determined by means of microthermobalance.
The diffusional coefficient, which varies with concentration has been calculated by the resolution of Fick's Second Law at 345 ^{o}C.

INTRODUCTION

The loss of organic material by oil shale has been the object of kinetic studies 1-5 ; the powder shale sample has been essentially used. Only few researches dealt with massive samples 6,7 . All these investigations aim to determine the overall kinetic parameters of thermal decomposition phenomenon under a flow of inert gas. In general, physical phenomena, such as the concentration profile which accompany pyrolysis have never been detailed. In the present paper, we analyse only the diffusional phenomenon of the organic material in mineral support during the pyrolysis at constant temperature (345°C).

EXPERIMENTAL PART

A cubic sample (a= 7mm) is shaped in the rock of known characteristics (Table 1).This cubical form has four faces perpendicular to the sedimented plan (reference plan) and two faces parallel to the same plan. This geometrical form is obtained by polishing under ambient conditions.

The sample has been pyrolysed at 345°C under nitrogen gas during 5 , 10 and 15 minutes then quenched.

The analysis of the remaining organic material is carried out by sections in the chosen direction, followed by a complete pyrolysis at 445°C.

0040-6031/86/$03.50

Characteristics	Values	elements	value %
Density	2,02	Na_2O	0,32
Ash	60%	K_2O	1,30
Mineral CO_2	22%	MnO	0,01
Mineral carbon	6%	Fe_2O_3	3,32
Humidity	2,78%	CaO	30,78
Bitumen	1%	MgO	4,64
Total organic material	16%	TiO_2	0,24
Residue	84%	Al_2O_3	8,9
Loss by burning	40%	SiO_2	38,94

RESULTS AND DISCUSSIONS

The results of the analysis are represented in diagram (c,x) by curves according to a perpendicular (fig.1) or to a parallel direction (fig.2).

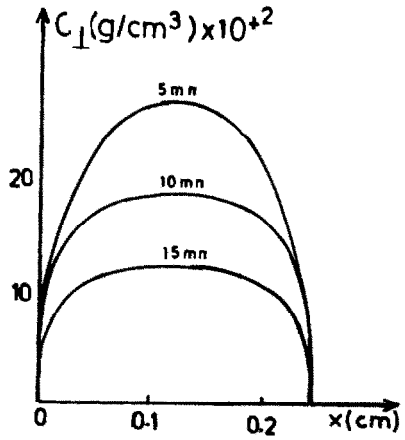

Figure 1 : Profile of concentration perpendicular direction. T=345°C. t= +5mn ; 10mn ; o 15mn

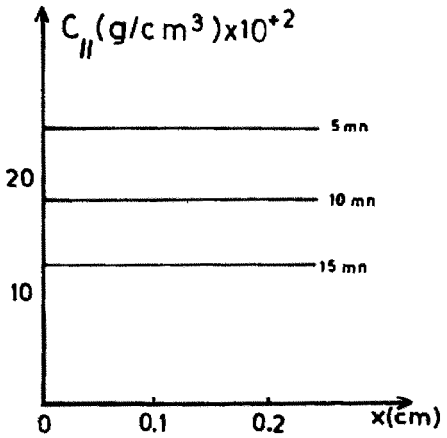

Figure 2 : Profile of concentration parallel direction. T= 345°C. t= + 5mn ; 10mn ; o 15mn.

In figure one, the concentration notably varies from the surface of the cube (x=0) to the centre (x=a/2). By contrast, in fig.2 , the concentration is practically constant. The evolution of organic material remains the same in both directions for 5 , 10and 15mn at 345°C.

THEORETICAL APPROACH

The experimental results respond to the following conditions :

t = o	o < x < a	C = Co
	x = a ; x = o	C = 0
t = o	x = o ; x = a	C = 0
	o < x < a	C = f(x) (fig 1)
		C = const (fig 2)

and represent respectively a variable or a permanent regime.

These two regimes can be interpreted by the solution of the second Fick law which gives the diffusional coefficients :

- Perpendicular direction,

$Dx10^{6}cm^{2}/$	5,3	6,1	6,6
time(mn)	5	10	15

Table 2.

- Parallel direction,

$D= 6,6 \times 10^{-6}cm^{2}/s$

Table 3.

These results show that the diffusional coefficient depends on the concentration of the perpendicular direction and not on that of the parallel direction. This is due to the difference of perpendicular directions in relation to the sedimented plan.

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