PAPER No. rtos-A102
International Oil Shale Conference :
"Recent Trends in Oil Shale", 7-9 November 2006, Amman, Jordan.

SINGLE PARTICLE COMBUSTION OF JORDANIAN OIL SHALE USING TGA AND FTIR SPECTROSCOPY

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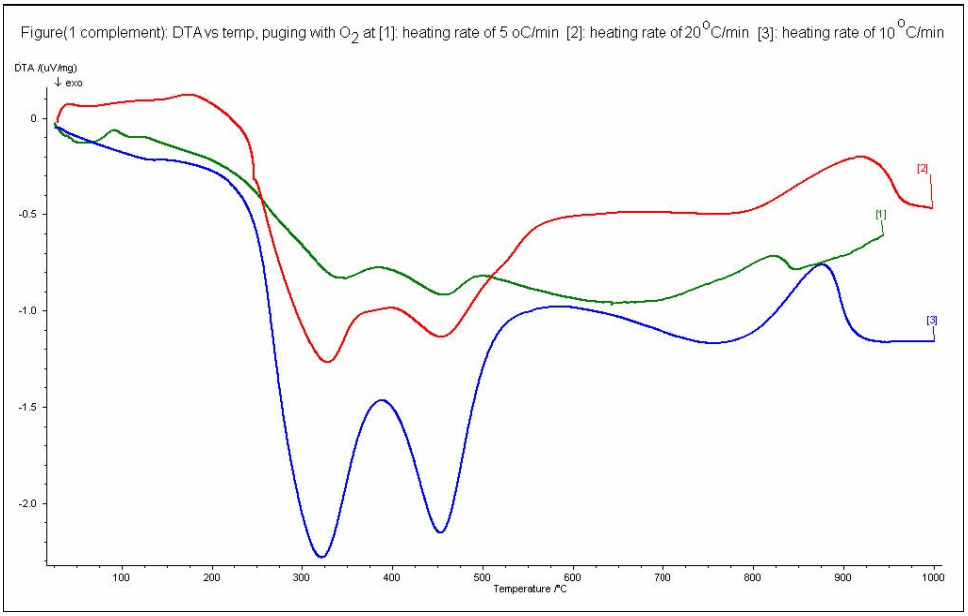
ABSTRACT

The techniques Thermogravimetric Analysis and Fourier Transform Infrared Spectroscopy were used to study the thermal properties of single particle combustion of Jordanian oil shale. Jordanian oil shale has light fractions which are released at lower heating rate of the particle. The gaseous compounds evolved from the thermo-oxidation of oil shale samples from different locations in Jordan are studied. The formation and emission of CO_2, CO, SO_2, HCl, CH_4, C_2H_6, C_2H_4, CH_3OH, HCOOH HCOH and some halo compounds was investigated. A correlation between the FTIR spectra and the origin of oil shale samples and the heating rate used was established. The kerogen fraction in the oil shale that converts to bitumen is found to be very reactive and burns easily on the surface of the particle. The carbonates began decomposing at around 700 ^{o}C and calcine completely at about 820 ^{o}C. This indicates the high reactivity of the mineral carbonates shale. A single peak appearing in the DTGA is probably due to softening of the bitumen and the entire organic matter seems to evolve with oxidation taking place in the gas phase of the furnace. Ultimately, upon feeding oil shale particle at low temperatures one has to be aware of flare up of volatiles released and we suggest that it is better to feed at rapid heating in excess of 50 ^{o}C/min. It is possible to devise a method of preheating in order to eliminate this problem of flammability in the furnace unit.


Figure(1 complement): DTA vs temp, puging with O_2 at [1]: heating rate of 5 oC/min [2]: heating rate of 20 ^{O}C/min [3]: heating rate of 10 ^{O}C/min
DTA /(uV/mg)
↓ exo
0
-0.5
-1.0
-1.5
-2.0
100
200
300
400
500
600
700
800
900
1000
Temperature /°C
[1]
[2]
[3]