

Variability of Jordanian Oil Shale and Processing Technologies

Feras Fraige, Hani Al-Nawafleh, Laila Al-Khatib, and Mohammad Dweir
 College of Mining and Environmental Engineering,
 Al-Hussein Bin Talal University
 Maan P.O. Box (20)
 Jordan
Dr.feras@ahu.edu.jo and FerasFraige@yahoo.com

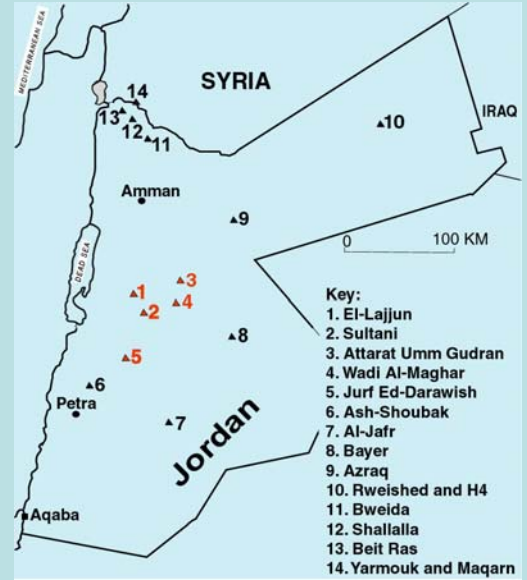


Fig. 1: Oil Shale distribution in Jordan. Study focus on oil shale deposits in central Jordan (highlighted in red).

Introduction

Jordan has huge Oil Shale (OS) reserves spread over the country, with about 50 billion tons are located in the central part (Fig.1). OS is expected to play crucial role in the Jordanian economy in the near future. Oil shale deposits occur in several horizons mainly that of upper Cretaceous Muwaqqar Chalk Marl Formation with more than 350 m in the Yarmouk area. In central Jordan, OS deposits are found in localized basins. Jordanian OS show variability in their chemical and physical properties, and thickness. The variability of OS in central Jordan is highlighted. In selecting OS processing technology, this variability should be considered.

Lateral variability

- OS in central Jordan has variable thickness and stripping ratio (Fig 2). It demonstrates suitability for surface mining.
- Chemical and physical variability between the main OS deposits is illustrated in Fig.3 and 4.

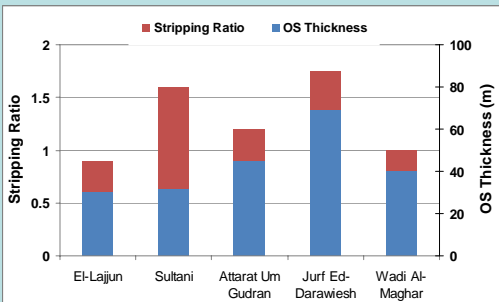


Fig.2: Oil Shale thickness and stripping ratio variation across the different deposits.

Local variability

- Within the same deposit (e.g. El-Lajjun), the physical and chemical properties are variable (Fig.5).

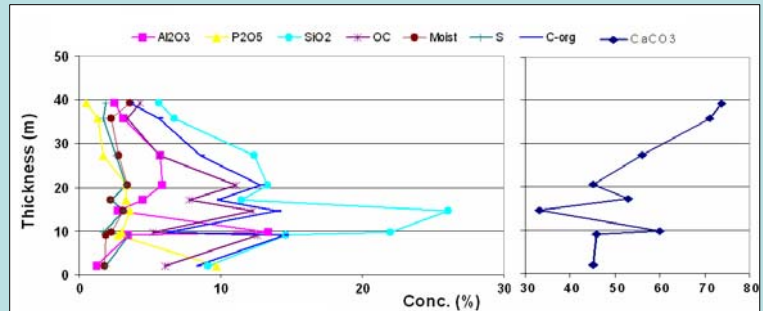


Fig.5: Vertical variability in some physical and chemical composition of El-Lajjun OS deposit, central Jordan.

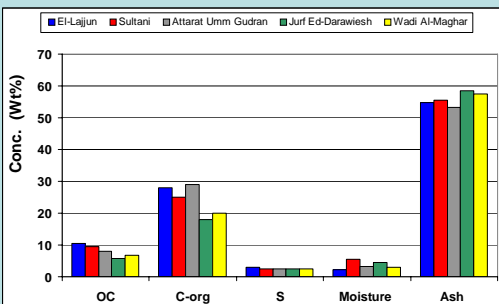


Fig.3: Variability in some chemical and physical properties of OS deposits in central Jordan.

Processing Technologies

- Previous technical and exploration studies proved the suitability of Jordanian OS for retorting or direct combustion without taking into account OS variability.
- Direct combustion is favoured if high sulphur content is overcome and combustion occurs at temperatures less than the deformation temperatures of carbonate.
- Retorting should take into account the high sulphur content.
- Technical and environmental issues delay the OS utilization.
- Research may be diverted to more environmentally-friendly techniques such as supercritical fluid extraction and accelerated solvent extraction.

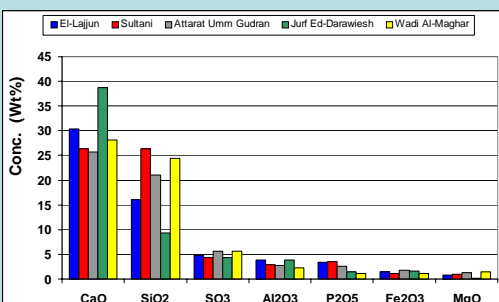


Fig.4: Variability in the chemical composition (major oxides) of OS deposits in central Jordan.

Conclusions

- Jordanian OS shows local and lateral variability.
- Oil shale in central Jordan reveals relatively high oil content, relatively low moisture and majority of carbonate and silicate phases with sulphur content of approximately 3 % wt.
- OS variability should be taken into account in selecting the most relevant processing technology.

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