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Preliminary Reservoirs Characterizations of Silurian Shale, Case of Ahnet Basin, Southern Algeria

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ABSTRACT : *Reservoirs characterization still the best way to predict production and suggest future well plan, The advance method in unconventional reservoir is the determination of hot shale interval distribution along the shale thickness in a vertical well and proposes the sweet window according this distribution for future well which should be drilled horizontally with integration of logging data combined with clay mineralogy analysis, This mixture of measurements provide a global characterization of potential zones (Hot Shale or sweet window). The aim of this paper is to present a case study of Silurian shale in Ahnet Basin therefore a well is drilled vertically and it exhibits a shale formation around 200m of thickness, ions of XRD results and logging data highlight that the potential zone located in the lower Silurian and it correlatese positively with abundance of illite.*

KEYWORDS: *Reservoirs characterization, sweet window, Logging Data, Silurian Shale, Clay Mineralogy Geochemical Analysis.*

I. INTRODUCTION

Hypothese and aim of study : All geochemical study confirms that silurian shale is the principal source rock, using a new signification is the main unconventional reservoir in Ahnet Basin, located at the Algeria southem, with their specific petroleum system which serves as source, seal, and reservoir rock, In this paper we use the hypotheses that the Organic-rich rocks can be relatively highly radioactive (higher gamma-ray reading than ordinary shales and limestones and Organic-rich rocks determined by the increase in sonic transit time and in resistivity (**Passey et al, 1990)** Our study carried out on the silurian shale encountered in a well drilled in Ahnet basin, The main target of this study is to locate the potential zone in the vertical section of shale reservoir this potential zone must be determined with accuracy, using logging data correlate this zone with clay mineral abudanc for a geochemical characterization and suppose a horizontal well plan in order to overlay potential zone laterally for a high hydrocarbon recuperation after frac job. The geochemical analysis summry of Silurian shale in Ahnet basin illustrates that the organic matter is mainly type II of marine kerogen, represent dry gas window in most of the basin with TOC between 2- 4 %.

Boundaries Location of Ahnet Basin : Ahnet Basin located in the West-Central part of Southern Algeria. borded to the north by Timimoun basin, in the west by reggane basin, to the east and to the south by Moudir

basin and famous Hoggar Massif, with a superficie around 75.000Km2, this basin is far about 1200Km from capital, it situated between the following geographic coordinates (Fig.1)

Easting : 01° 00’ – 03° 00’

Northing:24° 00’ – 27° 00’

Stratigraphy: The studied basin is covred by over of 3000m of Paleozoic sediment laying the Precambrian basement and rarly overlaind by fin layer of Mesozoic.

The Paleozoic is represented by many formations from the bottom to the top (Fig.2):

- Combro-Ordovicien: predominatly sandstone, transparent to trancluciде, quartzitic with fine layer of shale.
- Silurian: Shale black to dark grey, silty, mecaceouse, fluky, carbonaceous.
- Devonian: alternating sandstone with shale, passage of fin layer of limestone.

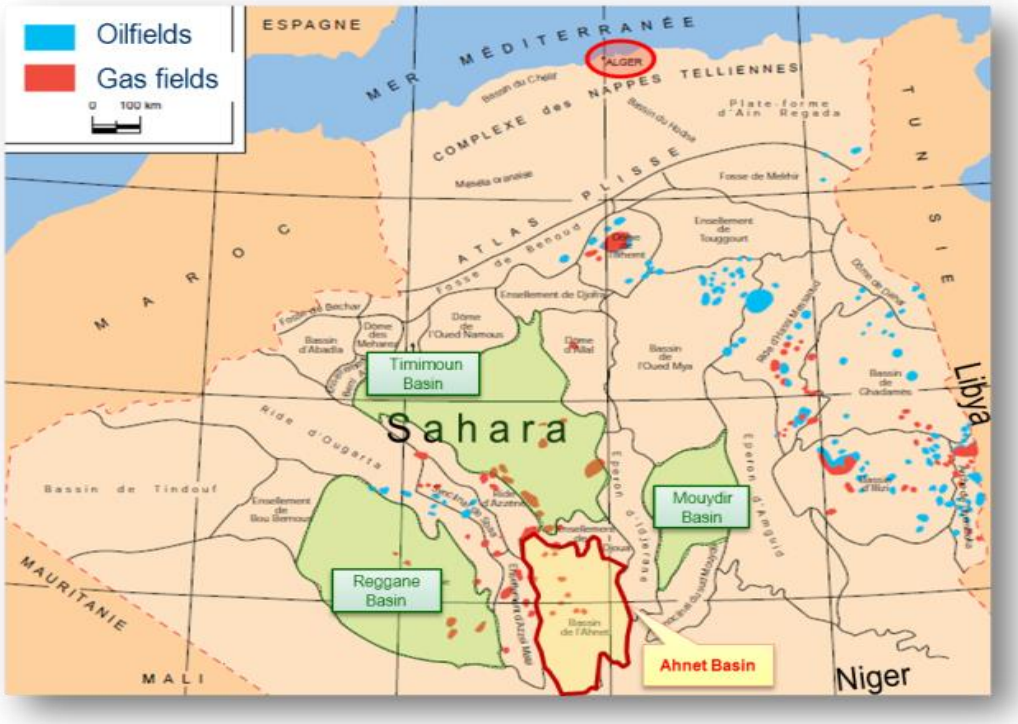

Fig.1. Geography of Algeria

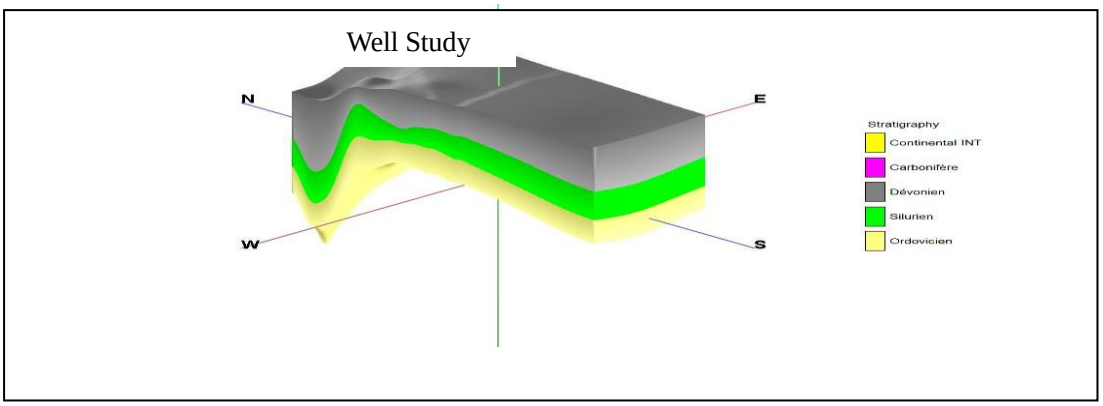

Fig.2. Stratigraphic model of perimeter study

II. EXPERIMENTAL

X-ray diffractometry (XRD) : nine (09) shale samples were analyzed for mineralogical characterization by X-ray diffractometry (XRD), are finely ground, and then subjected to an X-ray beam to be diffracted by the reticular planes of the present crystalline phases.

This is governed by the Bragg law; $\mathbf{n\,\lambda = 2d\sin\theta}$

where λ = wavelength in angstroms.

d = interplanar spacing in angstroms.

θ = angle of diffraction or reflection in degrees.

The choic of analyzed sample is after the determination of potential and non-potential zone using logging data.

Spectral gamma-ray: Logging process is one of the important operations for well site geoscientiste, Gamma-ray spectra has been performed using downhole logging tools the spectral gamma ray log measures the natural gamma radiation from a formation from each of the major radio-isotopic Sources. Analyses of the sources of the natural gamma radiation give us added information concerning the composition and likely lithology of the formation. Downhole tolls consist of a set of sensors who emating radioactive ray the amplitude of the output from the gamma ray sensor is proportional to the energy of the incident gamma ray. We can use this information to measure the proportion of the total gamma radiation coming from each of potassium-40, the uranium-radium series, and the thorium series for a particular formation.

III. RESULTS AND DISCUSSION

This study focused on one well as case study drilled vertically to perform geological shale reservoir characterization by the interpretation of logging Data and XRD results, in this well the Silurian was encontred at 2460m and drilled out until 2640m, with an average thikness of 180m. The used method allowed the determination of potential zone in unconventional reservoir based essentially on behaviours of the amount of some loggin data like Gamma ray and Uranium which shows a strong correlation with organic carbon, probably because UO2 precipitates under reducing conditions Therfore, it indicates more organic matter is preserved.

logging data show that the lower silurian is the potential zone caracterised by hight gamma ray and Uranium concentration, from 2620m 2640m (Bottom) with gamma in the range between 182-932 API and uranium between 8-73PPM Regarding these results a programe of horizontal well shold overlay the lower silurian. The mineralogical results with semi qontitative estimation of cuttings samples recovred while drilling show the abudance of illite with predominance, this abundance is correlated positively with potential zone, we suggest that from 2620m to the bottom (Potential zone or zone of hote shale) the concentration of illite progress positively in arrange between 30% to 60%. from 2610m to 2620m, a zone characterized by low concentration of uranium and gamma ray, while illite mineral is present with equal quantity with other mineral (Tab.1) The abudance of illite in the potential zone reflect the detirial character of clay fraction, in the current sediment this mineral is observed in areas in arid or desert climate.

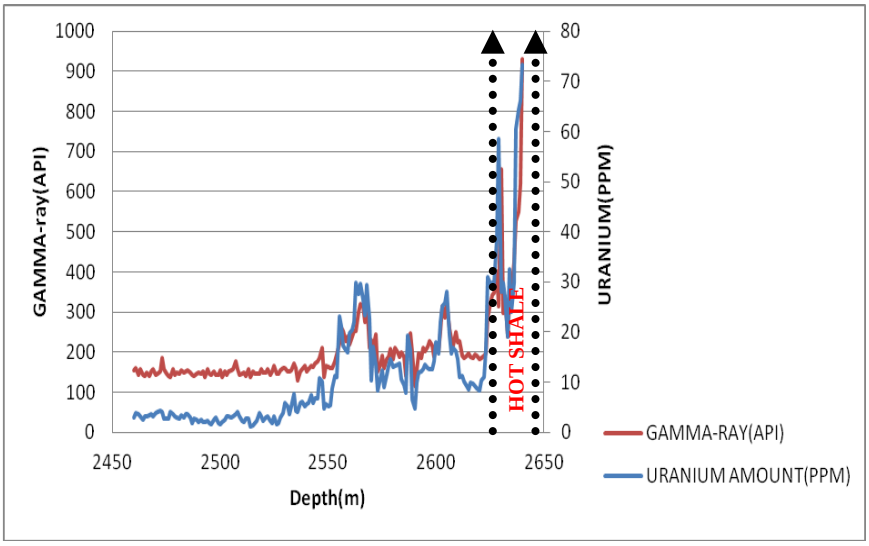

Fig.3. Variation of Gamma and Uranium Versus Depth

Table.1. Mineralogical Results

Depth	Kaolinite%	Illite%	Chlorite%	Interstratifier%
2500	20	25	30	25
2550	10	20	50	20
2610	15	30	35	20
2615	15	30	35	20
2620	15	30	35	20
2625	15	40	20	25
2630	10	50	15	25
2635	05	55	10	30
2640	0	60	10	30

IV. CONCLUSION

- The potential interval in the Silurian shale of in this well concentrates in the lower zone with high gamma-ray and uranium amount.
- The hote shale charachterized with e predominance of illite mineral.
- The mineralogy result show that the hot shale was deposite in aride climat with detritic character.

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REFERENCES

[1] Deconinck J F, Hesselbo S P, Bessa J, Averbuch O, Baudin F. Int. J. Earth Sci(Geol Rundsch), 2003, 92:255-266, Doi: 10.1007/s00531-003-0318-y

[2] Ruffell A, Worden R. Palaeoclimate analysis using spectral gamma-ray data from the Aptian (Cretaceous) of southern England and southern France. J. Palaeogeography, alaeoclimatology, Palaeoecology 155(2000) 265-283

[3] Ariketi R. Estimation of level of organic maturity(LOM) and total organic carbon (TOC) in absence of geochemical data by using resistivity and density logs-example from cambay shale,tarapur area,cambay basin,india. J. Indian association of sedimentologists,vol.30,No. 1(2011), pp.55-63

[4] Parkinson D N.Gamma-ray spectrometry as a tool for stratigraphical interpretation; examples from the western European Lower Jurassic. (eds), 1996, sequence stratigraphy in british geology,Geological society special publication No.103,pp.231-255.

[5] Fabricius L, Fazladic D L, Steinholm A, Korsbech U. The use of spectral natural gamma-ray analysis in reservoir evaluation of sliciclastic sediment: a case study from the middle Jurassic of Harald field, Danish Central Graben. Geological survey of Denmark and Greenland Bulletin 1, 349-366(2003).

[6] Hallam A, Grose J A, Ruffell A. Palaeoclimatic significance of change in clay mineralogy across the Jurassic-Cretaceous boundary in England and France. J. Palaeogeography, alaeoclimatology, Palaeoecology, 81 (1991) 173-187.

[7] Passey O R,Creaney S, Kulla J B, Moretti F J, Stroud J D. A Practical Model for Organic Richness from Porosity and Resistivity Logs. The American Association of Petroleum Geologist Bulletin,V.74.No12 December 1990.P.1777-1794.19Figs.7Tables.