

## **GEOCHEMICAL CHARACTERISTICS OF THE LOWER SILURIAN HOT SHALE SOURCE ROCK, NORTHERN PART OF THE MURZUQ BASIN, SW LIBYA**

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Lower Silurian Tanezzuft organic-rich “hot shales” are regarded as the principal source rocks for Palaeozoic oils fields in North Africa and in particular in the study area in the Murzuq basin, southern Libya (Echikh and Sola, 2000). Lateral extension, thickness, and organic geochemical characteristics of the lower Silurian hot shale as well as its maturity greatly control the petroleum generation in Murzuq basin. In this context, it was our major goal to study the Tanezzuft “hot shales” by a variety of geochemical and petrological methods in the framework of a numerical basin modelling study taking structural evolution into account (Meister et al., 1991; Davidson et al., 2000).

Cutting and core samples of the Lower Silurian interval were selected from two wells in the northern part of Murzuq basin. High TOC contents (up to 23 wt %) and hydrogen indices between 230 and 380 (mg HC/g TOC; Fig. 1) indicate the presence of very organic rich source rocks with moderately hydrogen-rich organic matter (Type II kerogen). These values and the thickness of more than 10 metres qualify this unit as excellent oil-prone source rock. Low Tmax values obtained from Rock-Eval pyrolysis (427-430°C) confirm an immature to early mature level of thermal maturity in the south western well. In contrast, much higher Tmax values (437-447°C) were obtained from the north eastern well in the study area which confirms mature to late mature levels. This is also confirmed by PI values (Fig. 2). Detailed molecular geochemical studies can accordingly be performed on early mature and highly mature “hot shales” and are currently under way.

Numerical 1D basin modelling was performed for two wells in order to assess the thermal maturity of the Tanezzuft hot shale and its evolution through time. Mean random vitrinite reflectance results using vitrinite-like particles for Lower Silurian hot shale, pyrolysis Tmax values and fluorescence colours indicate that the hot shale is immature-early mature in the southwest and clearly more mature in the northeast of the study area. Vitrinite reflectance results of source rocks from Devonian and Carboniferous intervals indicate that the samples studied are mostly immature or at most in the earliest part of the oil window (<0.7% VRr).

Thermal history modelling indicates that the present-day geothermal gradients and heat flows vary at different locations. The upper limit of the “oil window” occurs in the depth interval from about 1650m to 1980m. Results of thermal maturity analysis and reconstruction

of burial history suggest that the hot shale source rocks entered the oil window in mid-Cretaceous times.

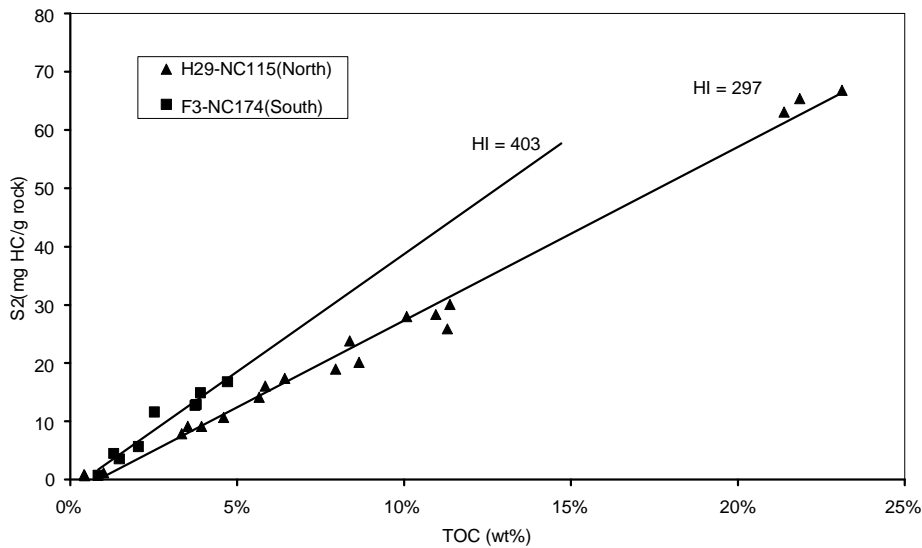


Figure 1. Rock-Eval S2 vs. TOC for samples from two wells in the study area

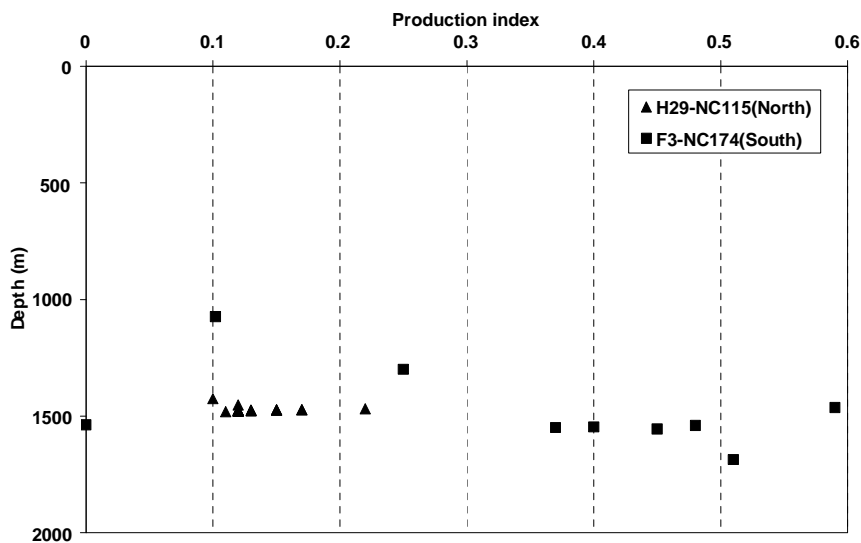


Figure 2. Depth plot of Rock-Eval PI values of samples from two wells in the study area

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