



Primary migration and expulsion – Application of QEMSCAN analysis and the Rock Eval Shale method on Cenozoic sediments from the Central Tertiary Basin of Svalbard

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Summary

The well BH 10-2008 (at Sysselmannbreen on Svalbard) consists of 1084 m of Cenozoic sediments which change from near shore marine environments at Paleocene times to deltaic and finally pluvial/alluvial deposits in the younger Eocene sections (Grundvåg et al., 2013). The research well has been cored entirely and QEMSCAN microscopic backscatter images and related elemental mapping connect the distribution of organic matter and sulphur to the depositional environment and enables us to differentiate between organic matter type changes for example in laminated sediments (pluvial ponds?) and rather fluvial-alluvial conditions within the upper core sections.

As part of a full-scale organic geochemical study, hydrocarbon generation and early migration has been investigated using a RockEval-6 instrument in Statoil's research laboratory in Bergen. Both the standard RockEval Bulk method (cf. Espitalié et al. 1985) and the RockEval Shale method described by Romero-Sarmiento et al. (2016) were performed on 214 samples. From the "shale method" a retention index (RI) ($RI=100-HQI$) is derived which relates to the Hydrocarbon Quality Index ($HQI=Sh_0Sh_0+Sh_1*100$) where Sh_0 and Sh_1 are the naturally formed gas containing condensates and black oil fractions, respectively.

The investigations indicate that different types of organic matter and the sedimentary facies have a significant impact on the hydrocarbon retention potential. Combining Hydrogen Indices, Retention Index and Production Index allows us to identify stages of HC generation and primary migration in different depositional environments (Figure 1). In addition, signs of primary migration were found within the transition from Paleocene to Eocene (PETM) by comparing the RI values with the portion of free and sorbed hydrocarbons which shows a strong correlation to resistivity log data indicate bitumen filling of the pore volume. Also, examples of retained bitumen within the early mature coals from the Eocene Aspelintoppen Fm. are shown. Those coals consist of mixed kerogens containing aquatic and land plant material with HI values above 260 [mgHC gC_{org-1}].

References

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