Biomarkers and Diamondoid Compounds in Crude Oils from the Norwegian Barents Sea

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Abstract

The Norwegian Barents Sea is located in the Arctic and oil and gas exploration activities have been active since 1980s. More than 150 exploration wells have been drilled and many oil and gas discoveries have been made. Multiple source rock intervals have been reported from the Carboniferous to Cretaceous in the Norwegian Barents Sea (e.g. Ohm et al., 2008) and it is important to identify the effective source rock to increase chance of finding hydrocarbons. We performed biomarker and diamondoid analyses on 4 crude oil samples from the Norwegian Barents Sea and report the result of the analyses. All the oil samples were characterized by low Pristane/Phytane ratio and wax contents, possibly suggesting generation from the marine source rock deposited in reducing condition. The peak height of C29 norhopane was almost half of C30 hopane, indicating clastic source rock origin. Significant peaks of extended tricyclic terpanes were observed in the oils from the Well A, B and C and these oils were interpreted to have been generated from the Triassic source rock. On the contrary, the oil from the Well D showed much lower peaks of extended tricyclic terpanes and was interpreted to have originated from the Jurassic source rock. We also performed GC-MS-MS analyses on the 4 oil samples and confirmed that all the oils were generated from the marine source rock based on the presence of C30 desmethyl steranes and were possibly originated from the marine algae older than Jurassic based on the low concentration of 24-norcholestanes (i.e. C26 steranes). C30 dinosteranes originating from marine dinoflagellates that are thought to have started to evolve in the Middle Jurassic were observed in the oil in the Well D, but not in the oils from the Well A, B and C. In conclusion, the oils from the Well A, B and C were derived from the Triassic marine source rock and the oil from the

Well D was derived from the Jurassic marine source rock. Based on the diamondoid compounds, it was suggested that there were two types of condensate components using methyl-adamantane index vs. concentration of adamantanes diagram (Okui et al., 2002). The one was thought to have been derived from the marine clastic (clay-rich) source rock, and the other was interpreted to have been generated from clay-poor carbonate/marl source rock (possibly Permian). We concluded that in the Well C and D, the oils were possibly mixed with condensates from the Permian source rock in the reservoir.