STABLE ISOTOPE GEOCHEMISTRY OF DIAGENETIC CEMENTS IN THE BRENT SANDSTONES FROM HILD, NORTH SEA

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The Middle Jurassic Brent sandstones in the Hild field, offshore Norway, constitute major petroleum reservoirs sitting at present-day depths of 3.8-4.3 km and temperatures of 140-155°C. They have been submitted to intense diagenetic alteration dominated by deep burial precipitation of quartz, dickite, illite and calcite cements. Constraints from petrography, fluid inclusions and K/Ar ages indicate that these cements formed at temperatures in excess of 90°C, over the past 80 Ma. The diagenetic cements were analyzed for their 18O/16O, D/H and 13C/12C isotope ratios in 30 samples from 3 wells. Dickite and illite exhibit consistent d18O and dD values ranging from +13 to +15 and -70 to -60 ‰ smow respectively. Two episodes of quartz cementation, readily distinguished by CL microscopy and fluid inclusion temperatures, have distinct average d18O values of about 20 ‰ and 23 ‰. SIMS oxygen isotope microanalyses of quartz overgrowths, however, show a continuum of values from 17 to 25 ‰. Calcite has d18O values of -15 to -11 ‰ PDB and d13C values of -10 to -3 ‰ PDB. Combining stable isotopic compositions with temperatures derived from fluid inclusions and/or modelled thermal history indicate that the cements formed from fluids isotopically similar to present-day formation water (d18O = 2 ‰, dD = -45 ‰), which acquired their isotopic composition as a result of water/rock interaction. No evidence was found for any significant contribution of ancient meteoric water.