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Profitable HP/HT Reservoir, Thanks to the Pressure !

Numerous theoretical and experimental works have been done in the past to understand the complexity of chemical reactions occurring in heated fossil oils. Obvious consequences of this process in High Pressure/High Temperature (HPHT) reservoirs are the regularity of the component distribution as a function of carbon number and the high n-alkanes content. In 1994 we began a R&D program to seek detailed mechanisms occurring in heated petroleum. Isotopically ¹³C labelled compounds (1-¹³C-n-C₁₂, ¹³CH₄) were introduced into pressured mixtures of gas and oil. By monitoring the ¹³C/¹²C in individual compounds by Gas Chromatography coupled with Isotope Ratio Mass Spectrometry (GC/IRMS), we were able to monitor the by-products of the labelled precursors introduced in oils before the experimentation. The results highlight the importance of gas as oil stabiliser agent during thermal stress, obviously the high pressure favoured the chemical incorporation of gases in oil. The pressure has almost no effect on the kinetics of the reactions in the dense hydrocarbon phase, but it has a significant influence on the thermochemical equilibria of the mixture. Our understanding of the phenomena is the existence of interwoven equilibrated clusters of compounds with a kinetically driven overall evolution. The present communication aims at providing selected results and new information on the consequences of the chemical reactions on the compositions and on the properties of fluids in HPHT reservoirs.