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Geochemical Characteristics and Formation Mechanism of Heavy Oil from M1 member, TW Block, Oriente Basin

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Exploration and development experience of TW block in Oriente basin show obvious oil gravity difference between different reservoirs (API range from 7.2° to 24°) and within one reservoir in different position (Eg. API ranges from 10.5° to 24.6° in Johanna Este reservoir). Well test show a positive relationship between oil API value and daily production, so it is vital to understand how does heavy oil formed and distributed. Base on 21 oil sample's geochemistry analysis, the paper discuss the geochemical characteristics and formation mechanism of heavy oil in M1 member, TW block. The result shows the heavy oil has the following characteristics: 1) Heptane and isoheptane are larger than 13 and 0.5 respectively, Toluene/n-heptane ratio and N-heptane/methyl cyclohexane ratio range between 1~3 and 0~1; 2) "UCM" phenomena (character of degradation oil) and complete normal alkanes series (character of normal oil) exist in one alkanes total ion figure; 3) Detected 25-norhopanes, character of biodegradation; 4) Oil API decrease in sandstone pinch out direction and high in local structure. All the features prove that 1) The heavy oil was formed by two times oil charging with one suffered degradation, results in the crude oil has both UCM and normal alkanes series; 2) Biodegradation is the major reason for heavy oil formation as 25-norhopanes was detected; 3) The sandstone pinch out area is the favourable area for heavy oil distribution, well is proposed to drilled away from sandstone pinch out area to harvest high production.