

Oil Sands Gathering Conditions and Models in Compressional Basin

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ABSTRACT

Most of oil sands resources locate in compressional basin. The oil sands gathering conditions in typical basins like western Canada basin, Eastern Venezuela basin and Zhunger basin was analyzed. The rich organic source rock is the basic condition to giant oil sands reservoir. Favorable migration and driving force for hydrocarbon affected the oil sands scale and geographic location. Water washing by meteoric water and bacterial degradation make hydrocarbon heavier and heavier. The paleo-delta facies, fluvial facies sands in compressional basin provide favorable space for oil to deposit. A widespread regional shale cap restrains hydrocarbon escape and the hydrocarbon fill up the sands. At last, according to the position of oil sands in compressional basin, oil sands gathering model in light pitch monocline and oil sands gathering model in compressional basin edge.

KEY WORDS: Oil sands; Heavy oil; Source rock; abnormal fault

INTRODUCTION

The exploration and development of oil sands in the world are accelerating. And the production ratio of oil sands in hydrocarbon energy is bigger and bigger. According to the data from USGS, there are about 651 billion barrels bitumen in the world (Jia, 2006). It distributes mainly in North America, former Soviet Union, Latin America and Caribbean Sea areas. compressional basin has the absolute advantage for oil sands to concentrate. Most of oil sands resources locate in compressional basin. The oil sands gathering basins like Western Canadaian basin, Eastern Venezuela basin and Jungar basin are the typical compressional basins (Dusseault, 2001). The Jungar basin is a important exploration area for oil sands in China and a typical compressional basin (Zhang, 2006).

Typical Oil-Sands-Bearing Compressional Basin

Western Canadian Sedimentary Basin

The Western Canadian Sedimentary Basin locates before the Rocky Mountain. The basin is a compressional basin characterized by significant thrust fault structure on the southwestern boundary. The WCSB becomes progressively thinner to the northeast, pinching out against the Canadian Shield igneous rocks (Flach, 1984). Alberta oil sands deposited in marine sediment it was controlled by oil sources and sand distribution. Athabasca, Cold Lake and Peace River are the three main reservoirs. Athabasca is the biggest oil sands reservoir in the world. The oil sands resources are about 23.8 billion tons. And 72.8 million tons oil was produced per annual (Jia, 2002).

Eastern Venezuela Basin

The Eastern Venezuela Basin locates before the Sierra Orientate. It is similar to the WCSB, but a smaller scale. The distance from the syncline to the Faja del Orinoco is 200-300km, whereas in Canada the distance is closer to 500-300km. The deep synclinal basin lies north of the Faja in front of the Sierra Orientale, a mountain front that has a tectonic structure based on combination of thrust and strike-slip faulting (Gutierrez, 1977). From the deep syncline axis, approximately east-west, the basin progressively shallows and pinches out to the south against the igneous rocks of the Guyana Shield (Dusseault, 2001). It is 600km long and 50 km wide. The oil reserves are 21.6 billion cubic meters (Gutierrez, 1977).

Northwestern Edge of Jungar Basin

The northwestern edge of Jungar Basin is between the western orogenic zone and the Jungar block, which is 250km long and 20km wide (Wei, 2007). The Manasi Lake source rock is several kilo meters from the reservoir. The edge near the mountain was compressed intensively and there are many reverse thrust. The the oil in oil sands are 0.51 billion tons bellow the depth of 100m and 0.92 billion tons bewteen the depth of 100m to 500m (Jia, 2002).