

Variation in Oil Biodegradation Level Along Long Horizontal Well Sections in Tar Sand Reservoirs

Tamer Koksalan*

University of Calgary, Petroleum Reservoir Group, Calgary, Alberta, Canada
tamer.koksalan@ucalgary.ca

Haiping Huang, Barry Bennett, Jennifer Adams and Steve Larter
University of Calgary, Petroleum Reservoir Group, Calgary, Alberta, Canada

Yuhong Liao

Guangzhou Institute of Geochemistry, Guangzhou, China

Abstract

A defining characteristic of heavy oilfields is the variation in fluid properties on a variety of spatial scales resulting from variable biodegradation of the petroleum. These variations are not only important in helping to predict fluid property predictions but can also be used to allocate production from long well bores using simple mixing models and quantitative petroleum geochemical data obtained from produced fluids. We describe the variations in biodegradation level along a horizontal well section using classical petroleum geochemical approaches modified for the difficult analytical environment of tar sand bitumen.

We describe the level of biodegradation along the well section and identify the components which are best suited to assess the subtle variability of biodegradation level and thus fluid properties along the wells. These components vary across the Albertan tar sand province. In the samples studied, which are biodegraded to around Peters and Moldowan level 4 to 5, isoprenoid alkane and alkylbenzene distributions, among other components seem ideal for this application as they show significant variability, while more resistant components such as diasteranes and aromatic steroid hydrocarbons are largely unaltered. We illustrate schematically how production allocation may be achieved using this variability.