

The Montney Formation – a low-permeability reservoir challenging organic geochemical perspectives for the transition towards a low-carbon economy

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In recent years, low-permeability hydrocarbon reservoirs have been found to operate under a peculiar natural gas geochemistry. Gases in molecular and isotope equilibrium as well as more complex phenomena such as isotope reversals are some of the topics in discussion [1][2]. However, little is known about new geochemical approaches that are required (or not) to study molecular and isotope distributions in liquid hydrocarbons from unconventional petroleum systems. The Lower Triassic Montney Formation, in the Western Canadian Sedimentary Basin (WCSB), is a difficult yet suitable example to explore some of these novel approaches because it presents a large number of scenarios that challenge traditional geochemical perspectives. This is due to its hybrid character containing gas/condensate petroleum generated from thermal alteration of migrated oil, thermal degradation of original kerogen, and/or mixtures of both [3]. Some of the organic geochemical features that we have identified in liquid hydrocarbons from the unconventional Montney Formation include the following: (i) different solid bitumen types exhibiting varying reflectance (typically low values <0.4% may be attributed to phase fractionation and higher values >1% attributed to thermal alteration), (ii) significantly ¹³C depleted n-alkanes (~-38‰) in migrated hydrocarbons carrying metals such as Zn and Ag, (iii) a series of polycyclic aromatic hydrocarbons (PAH) relatively increasing with thermal alteration of oil or in some cases associated to inertinite macerals and potentially slow-heating paleofires, (iv) widely distributed arylisoprenoids including isorenieratene. All of these confirm that generation mechanisms for hydrocarbons accumulated within Montney were multiple, and the key gap to address is the boundaries of these mechanisms through the low-permeability hydrocarbon plays. Our efforts to optimize hydrocarbon extraction from the unconventional Montney play a critical role in the transition towards a low-carbon economy in the region.

References:

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