

## Water-soluble hydrocarbons in petroleum

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During petroleum production, transportation, blending, and processing, smooth operations depend upon well-behaved petroleum phase behaviour. Oil is supposed to separate from water; petroleum streams are supposed to be liquids. When petroleum crudes and feedstock do not follow these rules, process upsets occur. Poor phase behaviour is usually blamed either on the most polar species in crude oils, asphaltenes, or on long-chain waxes. Precipitates formed from either of these types of hydrocarbon species result in equipment fouling and plugging problems.

The industry has other problems when water is present. Water is supposed to separate from petroleum hydrocarbons. If oil-water emulsions are formed, perhaps by pumps, water separation is inhibited and so chemical treatments are implemented to mitigate the problem. Sometimes, however, the usual methods for correcting process upsets are not successful indicating that the cause of the upset is not understood. An example of this situation occurred for a refinery desalter: the water phase of the desalter became "black", suggesting that oil had moved from the oil phase to the water phase. It was not obvious why and corrective measures did not work.

Samples of the desalter water phase were received at CanmetENERGY. Both the inorganic and organic contents of the sample were fractionated and analyzed. Two types of hydrocarbon species were found and characterized using techniques such as elemental, metals, nuclear magnetic resonance and electron microscopic analyses. The first type of hydrocarbon was soluble in chloroform and had characteristics similar to petroleum. The nature of the second type of hydrocarbon was unexpected. It was water soluble, having characteristics consistent with biological origins. This presentation will describe the isolation methods and analytical results for these two types of hydrocarbons. Speculations will be made as to how water-soluble components found their way into the oil.