

## **New Science Intellectual Property: Issued Petroleum Habitats Patents**

[“In situ conversion of heavy hydrocarbons to catalytic gas.”](#) Numbers CA2674322A1, US8091643, US20080115935, US20100200234, WO2008085560A1, Jan 6, 2015, Frank D. Mango and Petroleum Habitats.

A method of producing natural gas from a heavy hydrocarbon-containing subterranean formation includes: placing a catalyst having at least one transition metal into the formation, injecting an anoxic stimulation gas into the formation, and collecting the natural gas generated in the formation. The method may be performed outside the context of a subterranean formation under controlled conditions. Thus, a method of producing natural gas from bitumen includes: providing an anoxic mixture of heavy hydrocarbons and a catalyst having at least one transition metal, adding an anoxic stimulation gas to the mixture, and heating the mixture in the presence of the stimulation gas.

[“Detecting and Remediating Hydrogen Starvation of Catalytic Hydrocarbon Generation Reactions in Earthen Formations.”](#) Number US8727006 B2, May 20, 2014, Frank D. Mango and Petroleum Habitats.

Methods and apparatus for promoting the production of oil and/or gas from organic carbon-rich sedimentary rocks in a subterranean formation. Aspects of the method comprise detecting hydrogen starvation in the formation and remediating the hydrogen starvation.

[“Generating natural gas from heavy hydrocarbons.”](#) Number US8273937 B2, Sep 25, 2012, Frank D. Mango and Petroleum Habitats.

Methods for producing in a reactor natural gas from heavy hydrocarbons. A mixture of heavy hydrocarbons and a catalyst comprising a transition metal are heated under an anoxic condition in a reactor. Natural gas, e.g., catalytic natural gas, is generated from the heavy hydrocarbons by a disproportionation reaction promoted by the catalyst. The anoxic condition can be created by flowing an anoxic stimulation gas in the reactor.

[“Rock assay for predicting oil or gas in target reservoirs.”](#) Number US7153688 B2, Dec 26, 2006, Frank D. Mango and Petroleum Habitats.

The present invention relates to assays for ascribing catalytic activity to rock samples by virtue of zero-valent transition metals potentially being present within the sample. Embodiments of the present invention are generally directed to novel assays for measuring intrinsic paleocatalytic activities ( $k$ ) of sedimentary rocks for converting oil to gas and projecting the activities to the subsurface based on the measured linear relationship between  $\ln(k)$  and temperature ( $T$ ).