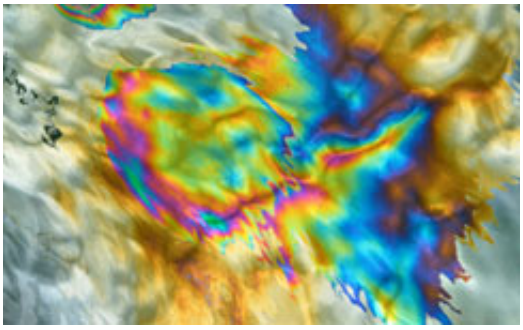
Magnetic rocks aid oil exploration

July 3 2013, by Harriet Jarlett



A new study has pinpointed the relationship between oil reservoirs and magnetic rocks, which could lead to more accurate oil exploration.

Previous research suggested there was a link between hydrocarbons – like natural gas and petroleum – and magnetism, but we didn't understand how the two were connected. Researchers from Colombia, Venezuela and the UK wanted to change that.

The new paper, published in *Geochimica et Cosmochimica Acta*, showed for the first time that as hydrocarbons push through the surrounding rock, they can cause it to gain magnetic properties. But over time bacteria enter the hydrocarbons and cause them to degrade. As the bacteria respire they change minerals like magnetite into less magnetic ones like haematite.

'The invasion of hydrocarbons into rock appears to have a positive effect on the formation of magnetic minerals,' explains Dr Stacey Emmerton, of Imperial College London, lead author on the study. 'But the introduction of bacteria into the hydrocarbons can occur at any time, and this appears to have a negative effect on the magnetic signature.'

'When there is more oil present or the oil is lower quality, then the amount of magnetisation decreases,' she says.

The quality of oil is determined by the percentages of different components found in it. as the bacteria respire the samples become biodegraded, which causes them to become lower quality, and gives them a weaker magnetic signal.

The team reached their results after testing both the quality of the oil and the magnetisation of the rocks.

When exploration companies find a possible source of petroleum using geological mapping of the rocks in the area, they have to run the risk that oil has migrated into the rock and become trapped there for them to mine.

Understanding the magnetic signatures of the rocks near hydrocarbons could help oil companies map where reservoirs suitable for extraction might be and could provide the only direct method for determining the path the migrating hydrocarbons have taken.

By understanding the mechanisms involved Emmerton hopes to have brought some harmony to the confusing catalogue of previously published observations on the topic.

More information: Emmerton, S. et al. (2013) Correlating biodegradation to magnetization in oil bearing sedimentary rocks,

Geochimica et Cosmochimica Acta, Volume 112, Pages 146-165.