Magnetic Resonance Imaging of Petroleum Reservoir Cores

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Abstract
The determination of fluid behavior (porosity, permeability, etc.) within hydrocarbon reservoirs is important because cost-effective, efficient production of hydrocarbons depends on accurate knowledge of reserve estimates, hydrocarbon distribution and hydrocarbon flow properties.

Porosity heterogeneity at the core scale is difficult to assess by conventional petrophysical methods. Standard spin-echo MRI methods also fail because of complications associated with the multi-exponential nature of spin-spin relaxation time decay and restrictions on the minimal echo time. The SPRITE MRI technique, developed at the University of New Brunswick, permits direct quantitative measurements of absolute fluid content and imaging of samples with short MR signal lifetimes.

In this presentation we will outline the basis of conventional and SPRITE MRI methods and in particular prove that the latter provides direct measurements, in the first instance, of local fluid content, i.e. porosity.

The full range of existing magnetic resonance methods for determination of flow velocity, relaxation time distribution, absolute fluid content and determination of water and oil phases may now be spatially resolved. A very wide range of laboratory core plug studies, spatially and temporally resolved, are now accessible to MRI investigation.

Reference
Marica, F., Chen, Q., Hamilton, A., Hall, C., Al, T. and Balcom, B. J. "Spatially Resolved Measurement of Rock Core Porosity", *Journal of Magnetic Resonance* **178**, 136-141, 2006.