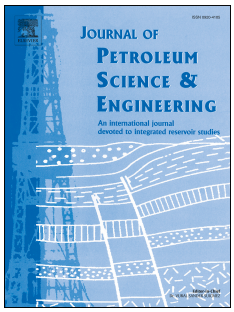
Accepted Manuscript



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Felipe R. Branco, Natália A. Gil, Osvair V. Trevisan

PII: S0920-4105(17)30522-3

DOI: 10.1016/j.petrol.2017.06.023

Reference: PETROL 4035

To appear in: *Journal of Petroleum Science and Engineering*

Received Date: 8 March 2017

Revised Date: 16 May 2017

Accepted Date: 10 June 2017

Please cite this article as: Branco, F.R., Gil, Natá.A., Trevisan, O.V., NMR study of carbonates wettability, *Journal of Petroleum Science and Engineering* (2017), doi: 10.1016/j.petrol.2017.06.023.

JOURNAL OF PETROLEUM SCIENCE AND ENGINEERING 000 (2016) 000–000

Contents lists available at ScienceDirect

Journal of Petroleum Science and Engineering

Journal homepage: www.elsevier.com/locate/petrol

NMR Study of Carbonates Wettability

Felipe. R. Branco, Natália. A. Gil and Osvair. V. Trevisan

Center for Petroleum Studies
University of Campinas, Cora Coralina Street, 350 - Campinas / SP - Brasil PO Box 6052

ARTICLE INFO

Article history:
Received 00 December 00
Received in revised form 00 January 00
Accepted 00 February 00

Keywords:
NMR, Carbonates, Wettability

ABSTRACT

Currently, carbonate rocks account for more than half of the world's hydrocarbon reserves. However, this particular type of rock has a number of features that make it a complex challenge for characterization and management of an oil field. The challenges related to production from carbonates have, as a key factor, the fact that 80% to 90% of them present oil or neutral wettabilities, leading at the end to a low oil recovery factor (RF). This paper presents the recent advances in nuclear magnetic resonance (NMR) to quantify and characterize carbonates wettability and how much the information derived from this tool can be used in the quantification of success of advanced enhanced oil recovery methods in such rocks.© 2016 xxxxxxxx. Hosting by Elsevier B.V. All rights reserved.

1. Introduction

The behaviour of carbonates rocks has received much attention in the last years. The reason is that nearly 50% of the world's known resources are located in carbonates, and the average oil recovery worldwide in such rocks is far less than 30% (Strand et al., 2006). In contrast to sandstones reservoirs, literature data indicates that about 80% to 90% of the world's carbonate reservoirs show a negative capillary pressure, i.e., they are preferentially oil-wet, and it is one of the main reasons why carbonates present such low oil recovery factors.

In a porous medium containing two or more immiscible fluids, wettability is a measure of the preferential tendency of one of the fluids to wet (spread or adhere to) the rock surface. In practice, the full range of wettability, from strongly water-wet to strongly oil-wet, may occur depending on the oil/brine interactions with the rock surface. Thus, oil-wet rocks (as most carbonates) have greater affinity to oil than to water allowing oil to occupy the smaller pores and coat the majority of the surface.

Currently, there is no direct method to measure the wettability in the reservoir. Preserve the original condition of wettability of a core sample is almost impossible due to several factors, such as drilling fluids contamination and differences between pressure and temperature at reservoir and at surface conditions. All those factors can change the in situ wettability.

The most common practice in the oil industry to measure the wettability of a particular section of the reservoir is to remove a core sample, clean it, restore the conditions of wettability in-situ and apply a quantitative measurement method. This standard industry method is time consuming and expensive. Due to these challenges, it would be advantageous to develop a faster and less expensive method. Recent works published has indicated that the NMR measurements can provide a

* *Corresponding author.* Tel.: +0-000-000-0000 ; fax: +0-000-000-0000.
E-mail address: author@institute.xxx
Peer review under responsibility of xxxxx.

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http://dx.doi.org/10.1016/j.rgo.2013.10.012