

## CORE SURFACE ANALYSIS FOR WETTABILITY ASSESSMENT

**Christian Quet, Gérard Glotin<sup>\*</sup>, Pascal Cheneviere and Maurice Bourrel**

Groupement de recherches de Lacq, Groupe Elf Aquitaine, BP 34,  
64170 Artix, France

<sup>\*</sup> Elf Aquitaine, CSTJF, av. Laribau, 64018 Pau, France

**Abstract** Rock wettability is determinant for the behaviour of a reservoir subjected to any oil recovery process. As the surface chemical composition of the mineral is indeed mostly responsible for its wetting behaviour we investigated the relation between wettability and surface chemical composition.

The examination of the surface was achieved mainly through X-ray photoelectron spectroscopy (XPS) whereas wettability determination was established through detailed interpretation of core flooding experiments and wettability index measurements.

In the first part of this paper, the procedure to restore the original wettability of a core in a laboratory is examined. The wetting state of a reservoir is often difficult to assess because it is carried out on reservoir cores which have generally been contaminated by the various chemicals during drilling.

Berea cores have been used to assess the validity of the restoration procedure of polluted cores, by measuring the organic carbon content of the mineral surface layer. Starting from a virgin clean core, wettability was changed by aging with crude oil. The surface was studied before and after cleaning. The results show that the surface organic carbon content is well correlated with the wetting behaviour of the material defined by petrophysical measurements.

In the second part of the paper, we present the use of the surface analysis for the characterization of the intrinsic wettability of a given core. The aim was to establish the correlation between surface composition and the wetting characteristics of the mineral. A variety of cores has been investigated, which include Berea samples as well as reservoir cores.

For very different cases, ranging from totally water to intermediate wet, a relation between surface chemical composition (mainly organic carbon concentration) and wettability has been investigated. Results concerning sandstone and carbonate originating from oil producing reservoirs are presented. We discuss the validity of the correlation for predicting core wettability.