Trace oil migration using element composition of reservoir diagenetic mineral: A preliminary case study in the Junggar Basin (northwest China)

J. CAO[1], L. XIE[1], X.L. WANG[2] AND W.X. HU[1]

[1]State Key Laboratory for Mineral Deposits Research (Nanjing University), Department of Earth Sciences, Nanjing 210093, China (jcao@nju.edu.cn)
[2]PetroChina Xinjiang Oilfield Company, Xinjiang Karamay 834000, China

In this study, we present a discussion on a new method for tracing oil migration based on a case study in the Junggar Basin (northwest China). Mn abundance of diagenetic calcites was used to trace oil migration. This proxy was preliminarily applied based on the theory of reservoir water rock interaction. The interaction between petroleum fluid, formation water and reservoir rocks is common in petroleum migration, thus the geochemical composition of diagenetic minerals can reflect petroleum migration.

In the Junggar Basin, the diagenetic calcite is widely occurred in hydrocarbon-bearing reservoirs. The calcites were analyzed for element compositions by electronic probe microanalysis (EPMA). Analytical results indicate that Mn-content of the calcites displays a generally good correlation with oil/gas shows. This implies that Mn-concentration has a close relation to the intensity of petroleum fluid charging. Here, mechanism of the positive correlation is discussed. In the Junggar Basin, mudstone source rocks are present with volcanic rocks. Thus, during hydrocarbon generation, acidic petroleum fluid will interact with volcanic rocks. As Mn is a typical element that enriched in volcanic rocks, the petroleum migrate from source sequences will be Mn-rich accordingly. This Mn-rich fluid will have less and less Mn-concentration along migration direction with decreasing intensity of petroleum charging. Consequently, diagenetic calcite formed in the fluid will have the same varying trend of trace element. Then, the Mn-content has a positive correlation with oil/gas shows. This likely provides a possible novel tracer for oil migration. In some case studies, the tracer was successfully applied, showing promising prospects.

Iron and aluminum precipitates as metals and metalloids sinks in a passive treatment system

MANUEL A. CARABALLO[1]*, JOSÉ MIGUEL NIETO[1], CARLOS AYORA[2]

[1]Department of Geology, University of Huelva, Avda 2 de Marzo s/n, E-21071 Huelva, Spain (*correspondence: manuel.caraballo@dgeo.uhu.es)
[2]Institute of Environmental Assessment and Water Research, CSIC, Jordi Girona 18, E-08034 Barcelona, Spain

Sorption capacity of synthetic or natural iron precipitates from acid mine drainages (AMD) has been widely studied by the use of laboratory batch experiments, while this kind of studies are less frequent concerning aluminum precipitates. However, a better understanding of the removal capacity of iron and specially aluminum precipitates at field conditions is needed.

For this purpose, we have study the different Fe and Al precipitates typically formed after the neutralization of AMD in the field. Monte Romero high monitored passive treatment system (SW Spain) was selected as the best field testing site because inside its reactive material the down flowing of AMD sequentially increases its pH, leading to the formation of two well differentiate Fe and Al precipitation horizons.

Mineral characterization was performed by XRD, Differential-XRD, SEM-EDS, EPMA and sequential extractions. Schwertmannite and goethite were identified as the Fe mineral phases in the studied samples, while the presence of hydrobasaluminite and amorphous $Al(OH)_3$ as Al mineral phases could only be suggested.

On the light of the sequential extraction results obtained, removed metals and metalloids could be classified in three different groups. The first group, including As and Ti, corresponds to elements completely removed in the Fe horizon. The second group includes elements complete (Cu and Pb) or partially (Zn) removed from the AMD by both Fe and Al precipitates, although Al precipitates removal is always higher than Fe precipitates removal. Finally the third group is formed by the elements completely removed by the Al precipitates (Si and Be). Although some of these elements were obtained after the specific sequential extraction step designed to release the adsorbed elements, only after the complete dissolution of the Fe and Al phases the great majority of the removed elements were released. These results offer a first insight into the stability and specificity of natural Fe and Al precipitates as metals and metalloids sinks.