

## Characteristics and distribution of H<sub>2</sub>-rich gas seepages in New-Caledonia

Eric Deville <sup>\*1</sup>, Gregory Paita <sup>1,2</sup>, Julie Jeanpert <sup>3</sup>, Olivier Sissman <sup>1</sup>, Isabelle Moretti <sup>4</sup>

<sup>1</sup> IFP Energies nouvelles, France

<sup>2</sup> ENGIE, France

<sup>3</sup> Service Géologique de Nouvelle-Calédonie, DIMENC, Nouméa, France

<sup>4</sup> UPPA - E2S, France

The results of a recent study complete previous works made about natural hydrogen in the ophiolitic rocks of New-Caledonia. Gas seepages are present in various places and they are associated to the deposition of carbonate deposit. The gases are H<sub>2</sub>-N<sub>2</sub>-CH<sub>4</sub> mixtures seeping into ultrabasic spring water (pH ~ 10-11; temperatures between 30 and 40°C). This type of gases shows H<sub>2</sub> contents between 12 and 34%, N<sub>2</sub> between 50 and 80%, and CH<sub>4</sub> between 9 and 18%. Close to the sole thrust of the ophiolites, the H<sub>2</sub> contents decrease and the N<sub>2</sub> contents increase. The isotopic values of H<sub>2</sub> and CH<sub>4</sub> correspond to classical values in high pH springs in ophiolitic massifs. The origin proposed to explain these emanations of H<sub>2</sub> is a process of oxidation of Fe(II) present in the ophiolitic rocks and reduction of the water present in the fractures system of the ophiolites. The methane, due to high C<sub>1</sub>/C<sub>2</sub> ratios (between 5000 and 13000), is interpreted as the result of microbial methanogenesis by reaction between H<sub>2</sub> and inorganic carbon present in subsurface.  $\delta^{13}\text{C}$  of CH<sub>4</sub> is a little higher compared to classical microbial gas and it is in accordance with those obtained in natural H<sub>2</sub>-rich gas seepages like in the Oman ophiolite. H<sub>2</sub> measurements using detectors made in lateritic soils (perforations ~ 1m) showed low levels of H<sub>2</sub> concentration. An autoclave experiment was made, in which 5 g of laterites were mixed with 150 ml of neutral water, with argon and hydrogen at constant pressure and temperature (temperature of 80°C). In this experiment, the laterite powder was kept in contact with water and argon by a stirrer. The result of this experiment suggests a mineral consumption of H<sub>2</sub> which, in addition to a probable microbial consumption of H<sub>2</sub>, could also explain the absence of H<sub>2</sub> in the lateritic shallow layers, even though H<sub>2</sub> is probably regionally generated at depth.

**Mots-Clés :** New Caledonia, ophiolite, gas composition, isotopes, hydrogen, carbonates

\*Intervenant