

# Natural Radioactivity and the Petroleum Industry

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# Background

- The presence of Rn-222 on natural gas was reported by Rutherford at the first years of the 20<sup>th</sup> century;
- Large quantities of He-4 is found on natural gas, being the natural gas an industrial source of helium;
- The abiogenic theory about the petroleum origin is based on the radiolysis of the organic matter motivated by alpha particles.

# Actual Issues

- Very large concentration of Ra-226 and Ra-228 is observed on the produced water discharged by new oil fields. Remembering that water:oil ratio in new oil fields is about 2-3:1;
- In Brazil, the monitoring of radium discharge from off-shore platforms is mandatory on a semi-annual basis;
- Values up to 80 Bq/L, Ra-226+Ra-228, was already detected by us on samples from off-shore platforms.

# Radioactive Scales

- Due to the mixture of barium rich formation water with sulfate rich seawater, which is injected to enhance the oil production, a radioactive scale is formed ( $\text{BaSO}_4$ ).
- Radium concentration on these scales are far beyond the IAEA exemption levels (10 kBq/kg for Ra-226 and Ra-228).



