Determination of levels of production chemicals in water phase using capillary electrophoresis

Aliti, Liridon; Andersen, Simon Ivar

Publication date:
2023

Document Version
Publisher's PDF, also known as Version of record

Danish Offshore Technology Centre
Technology Conference 2023

Determination of levels of production chemicals in water phase using capillary electrophoresis

Liridon Aliti, Simon I. Andersen

Handling produced water (PW) poses a great challenge in continuous oil production. Essentially new robust tools are needed for characterization of PW either online or at the end before discharge or re-injection. It is necessary to add various production chemicals to maintain oil production, but traces can potentially partition to the water phase depending on oil-water separation performance. This leads to an increased environmental impact factor (EIF) and a threat to aquatic life.

In this study, we use capillary electrophoresis as an analytical method to characterize PW. The technique belongs to the portfolio of analytical methods primarily used in biotech. Different compounds are separated in a capillary tube by electrophoretic mobility when a high voltage is applied over the capillary. Detection is performed by (in)direct UV-detection near the outlet of the capillary. The technique is qualified first with synthetic seawater (SW) to determine the ionic composition. The identification of the resulting signal peaks is performed by comparing the data to known salts dissolved in Milli-Q water. The same approach is attempted with PW from different fields to identify the constituents. Additionally, we can measure the concentration of production chemicals added to different media such as PW, SW, and water with different salinity. Our results tell us that quantification of production chemicals not only requires a calibration curve of the specific chemical, but also an internal calibration in the specific medium (ionic composition) at which the chemicals are present in. However, as the method can directly provide ionic composition this can directly be obtained. We further demonstrate the versatility of the instrument to measure the tendency of production chemicals partition between a water and oil phase which is used in assessing the distribution of the chemicals in the environment.