Danish Offshore Technology Centre
Technology Conference 2024

Quantification and identification of production chemicals in produced water 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.

We use capillary electrophoresis (CE) as an analytical method to characterize PW. The technique belongs to the portfolio of separation methods in biology and analytical chemistry. Different compounds are separated in a capillary tube by electrophoretic mobility when a voltage is applied between two electrodes. Detection is performed by (in)direct UV-detection near the outlet of the capillary. In this study, we analyze five different produced water samples from the discharge point. The ionic composition is quantified using the CE technique and compared to the same data obtained with ion chromatography. Only 2-3 min are enough to quantify the ionic composition which is valuable e.g. for monitoring of water flooding performance.

Additionally, we infer that there are unknown chemical constituents in the samples by observing unknown peaks in the data. One of the constituents is suspected to stem from a commercial corrosion inhibitor that is added to these oil fields but ends up in the produced water. We further demonstrate the versatility of the instrument to measure the tendency of oil production chemicals to either remain or migrate from the water phase in partitioning experiments between a water phase and either octanol or oil phase after contact for 24 hours.