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Unlocking Legacy Cuttings: A Geochemical Approach to CO_2 Storage Assessment and Subsurface Screening

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Rockwash Geodata

Millions of drill cuttings samples from thousands of wellbores remain stored in warehouses and core repositories worldwide, representing a vast but underutilised geochemical archive. With the growing need for subsurface characterisation to support CO_2 storage and other transition technologies, these legacy samples present a unique opportunity. By applying large-scale digitalisation and geochemical screening, we can extract valuable insights into reservoir quality, heterogeneity, and regional storage potential at low cost, without the need for additional sample acquisition.

The NOROG Released Wells Initiative (RWI) demonstrated the power of this approach by washing, imaging, and analysing a significant volume of cuttings samples from exploration and appraisal wells drilled offshore Norway. Using high-resolution imaging and non-destructive X-ray fluorescence (XRF) analysis, a standardised dataset was generated, now available for further industry and academic research. This geochemical screening enables the assessment of potential CO_2 storage reservoirs through key proxies such as Si/Al and Zr/Rb ratios, which indicate grain size variations affecting porosity and permeability, and Fe/Al and K/Al ratios, which help map depositional trends and regional heterogeneity.

To illustrate the broader application of this methodology, we will present examples from a similar study in the UK Southern North Sea, a key region for CO_2 storage projects due to its extensive infrastructure and favourable geology. The integration of data from both the Norwegian and UK sectors highlights how geochemical screening of cuttings can provide a rapid, cost-effective means of assessing subsurface storage potential in mature basins.

This approach also presents a valuable opportunity for collaboration with academia and national geological surveys, many of which hold large archives of publicly funded cuttings samples. These collections could be systematically analysed to support regional subsurface screening studies and feasibility assessments for storage site selection, unlocking accessible data that has so far remained underutilised.

By leveraging the legacy of hydrocarbon exploration, we can repurpose existing cuttings datasets to support CCUS research, as well as studies relating to critical mineral exploration and geothermal energy. As more digitalised cuttings datasets become available, they have the potential to play an important role in optimising subsurface management strategies for the energy transition.