



## **Feasibility of ASD AgriSpec analysis to indicate mineralogy of a potential shale gas reservoir from west Lancashire, UK**

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Mudrocks rich in organic matter present an attractive exploration target for unconventional gas and oil. The mid-Carboniferous (Visean - Bashkirian) Bowland Shale is developed in a series of fault-bound basins and is considered the principal accumulation of gas-prone shales in the UK. One risk with exploitation of shales is that the rocks may exhibit ductile behaviour and will not respond in an optimal way to hydraulic stimulation programmes. The brittle behaviour of the rock is strongly influenced by mineralogical composition. Approximately 15 m of core from the lower part of the Bowland Shale, has been used to test the feasibility of using Natural Infra-Red (NIR) Spectrometry to characterise the mineralogy of the shale, and compared to analysis using standard XRD techniques (both whole-rock and <2 micron) to confirm the mineralogical constituents of the rock.

Clay mineralogy has been the main focus, as their presence within the shale may affect the 'frackability' of the shale. Clay minerals are also easily detected using NIR spectrometry as they display distinctive absorption features in the Short Wave Infrared region of the electromagnetic spectrum. The benefits of using a handheld NIR spectrometer (AgriSpec) is that it provides a rapid, non-destructive and highly portable method for characterising clay mineralogy. This method may represent a simple solution to the initial characterisation of what are challenging rocks to characterise: thick accumulations (locally in excess of 3500 m) with few marker horizons to enable correlation between basins. Results demonstrate that clay minerals such as dickite, kaolinite and smectite (as well as other characteristic minerals such as siderite; calcite and gypsum) can be identified within the Bowland Shale using this technique.