Exploring for Oil, Gas Using Reflectance Spectra of Surface Soils

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Reflectance spectra in the visible and near-infrared wavelengths provide a rapid and inexpensive means for determining the mineralogy of samples and obtaining information on chemical composition. Hydrocarbon microseepage theory setup a cause-and-effect relation between oil and gas reservoirs and some special surface alterations. Therefore we can explore for oil, gas by determining reflectance spectra of surface alterations. This determination can be fulfilled by means of field work and hyperspectral remote sensing. In this paper, firstly a macroscopical feature of reflectance spectra of typical observation points in gas fields is presented. Then a method is proposed in order to provide surface distribution information (e.g., classification) of alterations based on the reflectance spectra determined from the field and remote sensing, and obtain anomaly zones of the special alterations. This method has been applied to exploration of oil, gas in progress in Qinghai Sanhu area of China using NASA experimental Hyperion hyperspectral satellite. Taking poor SNR (Signal Noise Ratio) of the Hyperion data into considerations, the reflectance spectra determined from the field were classified firstly, and then valid classification samples and method were provided to Hyperion data. The results of the two classifications are basically in accord with each other. A robustness analysis of the method presented in this paper shows that good results can be obtained when different combinations of parameters, such as samples, study band regions and thresholds, have been chosen in the process of classification. Finally an exploration procedure is concluded to improve efficiency and decrease cost based on our engineering practices.

Keyword: hyperspectral remote sensing, reflectance spectra, exploration of oil, gas, Spectral Angle Mapper