

Abstract

Swelling soils are a major engineering problem and the establishment of new and fast methods for their identification continues to be a major subject of research. Several engineering methods were here used to obtain indices used in the estimation of swelling potential in a group of soil samples with a wide variation in swelling and to classify them into swelling potential classes. The indices were then reduced through factor analysis to obtain a new swell index that was used to obtain the spectral parameters to best correlate with the index where absorption feature mapping, optical density, and derivative spectral data analysis methods were used to establish these parameters. The spectral parameters found to have high correlations with the swell index were then used to establish statistical empirical models to quantify soil swelling from spectral data. The physical understanding of these spectral parameters was also sought and the results show a close relationship between the clay mineralogy related bound water and hydroxyl spectral features in the soil spectra and the swelling index. The bound water parameters gave positive and the hydroxyl related parameters negative correlations to this index. The results confirm the strong influence of the clay mineralogy on the soil properties.