

Relationship between soil properties and corrosion of carbon steel

Abstract :

Soils constitute the most complex environment known to metallic corrosion. Corrosion of metals in soil can vary from relatively rapid material loss to negligible effects, depending on soil environment. Soil engineering properties and soil contents are important parameters that influence soil corrosivity and level of corrosion dynamic. Previous researches had successfully prevailed in investigating the soil corrosiveness, but mainly focused on the soil chemical content instead of soil engineering properties. Hence, this paper investigates the relationship of soil engineering properties towards metal loss of X70 carbon steel coupons. The study focuses on three types of major soil engineering properties which are moisture content, clay content and plasticity index. A total of 84 pieces of X70 coupons were placed in seven different types of soils for 12-months to study the influence of soil engineering properties towards metal loss via weight loss method. The coupons were thoroughly cleaned prior to installation to avoid any contamination or any possible entities that can affect the corrosion process. The soil and coupon were placed into a poly-bag to let the coupon corrode naturally. Since the soil samples were collected from five different locations covering 500-km distance, the soils in the poly-bags were transferred from its actual site to a single location for monitoring purposes. Statistical analysis was carried out to study the relationship between soil engineering properties and corrosion rate. The analysis consists of simple bar graph, linear regression, multiple regression method and Analysis of Variances (ANOVA). The site testing results indicate moisture content as the most governance effect on corrosion rate based on the correlation coefficient. Yet, further investigation using the Analysis of Variances (ANOVA) and multiple regression analysis showed disagreement with the initial result whereby none of the factors have significance influence on corrosion rate. Hence, other factors such as soil chemical content, microbiological activity or pollution may be more dominant in influencing the dynamic of underground corrosion.