

Influence of peat characteristics on cementation and pozzolanic reactions in the dry mixing method

ABSTRACT

Peat is a naturally occurring material that is high in organic matter, extremely soft, has a high moisture content, and exists in an unconsolidated state. Due to its high compressibility and low shear strength, peaty soils are geotechnically problematic. One of the most common methods for improving these soils is the dry mixing method. Important characteristics of peat are the presence of carbon dioxide (CO₂), nitrogen (N), and acidic or alkaline media, with a high ground water level. This paper presents the results of a study of the effects of peat characteristics on cementation and pozzolanic reactions over time when treating peats with cement and slag. The mechanical properties of the samples, cured for up to 180 days, were determined by performing an unconfined compressive strength test. Scanning electron microscopy was also carried out for selected samples to study the micro-structural changes taking place. It was observed that CO₂ dissolved in peat water caused an increase in the depth of carbonation by decomposition of calcium-silicate-hydrate (C-S-H) gel to form calcite (CaCO₃). The presence of increasing amounts of N had no tangible effect on cementation or pozzolanic reactions in the treated peats. Acidic media had a negative effect on cementation and pozzolanic reactions, whereas alkaline media improved the strength of the treated peats due to higher production of C-S-H gel. The strength of treated fibrous peat in water containing dissolved CO₂, and also in acidic media, was lower than that of the other peats due to its physico-chemical characteristics.

Keyword: Acidic and alkaline media; Cementation; Dry mixing method; Peat characteristics; Pozzolanic reaction