Patent Search

Invention Title	Dual Chemical Stabilization of Expansive Soil Using Cement and Aluminium Chloride
Publication Number	01/2026
Publication Date	02/01/2026
Publication Type	INA
Application Number	202541124388
Application Filing Date	10/12/2025
Priority Number	
Priority Country	
Priority Date	
Field Of Invention	CHEMICAL
Classification (IPC)	C04B 28/04, E02D 3/12, C09K 17/10, C04B 22/14, C09K 17/06

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Abstract:

The invention relates to a method for stabilizing expansive soil using an optimized dual-stabilizer system comprising 2% Ordinary Portland Cement (OPC) and 1.5% Alumin Chloride ($AlCl_3$) by dry weight of soil. Cement hydration products improve soil bonding and strength, while trivalent aluminium ions reduce swelling by contracting the diffu double layer through cation exchange. The combined treatment significantly reduces plasticity and differential free swell, and increases maximum dry density, California B Ratio, and unconfined compressive strength. Field validation using static plate load testing confirms improved load–settlement behaviour. The method provides a technica superior, cost-effective, and durable ground improvement solution for pavements, foundations, and other civil engineering applications involving expansive soils.

Complete Specification

Description:FIELD OF THE INVENTION

[001] The present invention relates to the field of geotechnical engineering, and more particularly to the chemical stabilization of expansive soils used in civil engineering works such as pavement subgrades, foundations, embankments, canal linings, and earth structures. The invention concerns an improved method for modifying the engineering behaviour of expansive soils through a dual-chemical treatment comprising Ordinary Portland Cement (OPC) and Aluminium Chloride ($AlCl_3$). The invention further relates to enhancing critical parameters such as Differential Free Swell (DFS), Atterberg limits, compaction characteristics, California Bearing Ratio (CBR), and Unconfined Compressive Strength (UCS), while reducing swell–shrink tendencies associated with montmorillonite-rich clay minerals. More specifically, the invention pert to a stabilization method that leverages the pozzolanic reaction mechanisms of cement together with the high-valence ion exchange capability of aluminium chloride to achieve significant improvements in the strength, volumetric stability, and load-bearing performance of expansive soils.

BACKGROUND OF THE INVENTION

[002] Expansive soils, particularly montmorillonite-rich Black Cotton Soils prevalent in many regions of India, are characterized by excessive volumetric changes when subjected to moisture fluctuations. These soils exhibit pronounced swelling during wet seasons and substantial shrinkage during dry periods due to the interlayer hydrat and dehydration of montmorillonite clay minerals. This high swell–shrink potential results in significant challenges for civil engineering structures, leading to pavement

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Page last updated on: 26/06/2019