

Stabilization of Fine Soils Using Lignin from the Pulp and Paper Industry for the Improvement of Tertiary Road Networks

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Abstract : Colombia's tertiary road network accounts for 69.2% of the national road system and faces significant challenges due to poor road conditions and the inadequate properties of fine-grained soils found in subgrades. These issues negatively impact connectivity, socio-economic development, and access to essential services in rural areas. Lignin, a natural biopolymer and by-product of the pulp and paper industry, has emerged as a sustainable alternative for soil stabilization due to its adhesive and hydrophobic properties. This study explores the use of lignin as a non-conventional stabilizer for fine soils. The methodology involves the physical, chemical, and mechanical characterization of materials, combined with laboratory tests to evaluate the behavior of soil-lignin mixtures under different moisture conditions and curing periods. The main objectives of the project are to determine optimal lignin dosages for various soil types and to analyze improvements in the strength, durability, and sustainability of stabilized soils. The expected results aim to demonstrate lignin's potential in enhancing the performance of subgrades in the tertiary road network while also promoting a circular economy by repurposing an underutilized industrial by-product. This approach aligns with global sustainability goals and offers an innovative solution for the development of resilient and environmentally friendly road systems.

Keywords : soil stabilization, lignin, tertiary road network, sustainability, infrastructure development

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