A Review on Utilization of Waste Marble Powder (WMP) as a Soil Stabilizer

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Abstract:

The construction industry continuously seeks sustainable and cost-effective solutions to enhance soil stabilization, a critical factor in improving the strength and durability of infrastructure. One promising approach is the utilization of waste marble powder (WMP) as a soil stabilizer. WMP, a byproduct of marble processing, is abundantly available and often discarded as waste, contributing to environmental pollution. This paper reviews the use of WMP to improve the engineering properties of soil, particularly focusing on its effects on soil compaction, plasticity, compressive strength, and durability. Through chemical and physical interactions, WMP has been found to reduce the plasticity index and enhance the load-bearing capacity of various soil types, thereby making it suitable for applications in roadbeds, embankments, and other civil infrastructure projects. Additionally, incorporating WMP in soil stabilization reduces the need for conventional binders like cement and lime, leading to lower carbon emissions. Experimental results from various studies indicate that WMP can significantly enhance soil stability, making it an eco-friendly, efficient, and economically viable material for sustainable construction practices. Future research should focus on optimizing WMP dosages for different soil types and long-term field performance to broaden the applicability of this green stabilization method.