7th International Conference on Civil Engineering, Architecture and Urban Planning Elites

Copenhagen, Denmark 19 - 21 July 2024

Utilizing Industrial Byproducts for the Development of Environmentally Friendly Road Base Materials in Kazakhstan

Yelaman Aibuldinov, Galiya Alzhanova, Zhanar Isakova

The Research Institute of New Chemical Technologies, L.N. Gumilyov Eurasian National University, 010008 Astana, Kazakhstan

Abstract

In the face of the escalating global issue of non-biodegradable industrial waste, this research pioneers an innovative solution by repurposing waste materials in road construction, offering a trifecta of benefits: recycling, economic viability, and ecological sustainability. Focusing on red mud, blast furnace slag, and lime production waste, the study explores nine formulations, revealing that a blend with 40% red mud, 35% blast furnace slag, and 8% lime production waste attains peak strength. Over time, these materials exhibit a remarkable strength increase: from 0.67-3.56 MPa at 3 days to 8.12-14.21 MPa after 365 days, meeting Kazakh regulations. Crucially, the developed road base materials demonstrate durability and environmental responsibility, devoid of heavy metal contamination. This research not only emphasizes the superiority of waste-derived materials but also employs advanced analytical techniques (X-ray diffraction, X-ray fluorescence, microscopy) to unravel their chemical and mineral composition, reinforcing the case for their adoption. The study underscores the sustainable use of industrial waste, mitigating landfill issues, and advocates for the widespread adoption of these road base materials that align with stringent environmental regulations, ensuring a resilient and eco-friendly infrastructure.

Keywords: blast furnace slag, lime production waste, natural loam, red mud, stabilizing