

UTILIZATION OF CONSTRUCTION AND DEMOLITION WASTE (CDW) AND INDUSTRIAL BY-PRODUCTS (IBPS) AS LOW-COST LIMING AGENTS FOR NEUTRALIZATION OF SOIL ACIDITY

*Isiri Upeksha Nagasinghe¹, Takeshi Saito¹, Akihiro Matsuno¹, Akira Kato¹, Ken Kawamoto¹

1. Department of Civil and Environmental Engineering, Graduate School of Science and Engineering, Saitama University, Japan

There are acidic soils widespread all over the world. Soil acidity has a greater potential to adversely impact on soil microorganisms, plant growth, deteriorating soil structure, heavy metal leaching and degradation of infrastructure. Liming has long been identified as a promising method to address the soil acidity. The most common liming agent is CaCO_3 , which is received from natural resources. If it is possible to use alternative materials having alkaline property, it would preserve natural reserves of CaCO_3 . Construction and demolition waste (CDW) and industrial by-products (IBPs) show alkaline property. If CDW and IBPs could neutralize the soil acidity, it would be a sustainable solution for the waste to be dumped into landfills too. Therefore, this study was carried out to evaluate the applicability of CDWs and IBPs for neutralization of soil acidity. Volcanic ash soil (VAS), laterite (L) and marine sediment (MS) were used as acidic geomaterials for neutralization. Their pH was 5.5, 4.9 and 4.8, respectively. The selected CDW was recycled concrete (RC) and, autoclaved aerated concrete (AAC) and IBPs were steel slag (SS), and fly ash. Two particle sizes (less than 0.106 mm and 0.106 - 2.00 mm) were used for SS, RC, and AAC. To compare the neutralization capacities of alternatives, typical liming agents of CaCO_3 , Ca(OH)_2 , and CaO were also tested. Liming agent was gradually added to each geomaterials until they become neutralized. The best neutralization capacity was shown by finer fraction of SS. 1.8%, 0.4%, and 0.5% weight of the finer SS neutralized VAS, L, and MS, respectively. Neutralization capacity of CaCO_3 was very similar to the finer fraction of SS. Thus, it is revealed that there is a potential of applying of CDW and IBPs as alternative liming agents. Nonetheless, it is necessary to evaluate the leaching of harmful chemical components including heavy metals from neutralized soils to soil and groundwater.

Keywords: Acidic soil, neutralization, construction and demolition waste, industrial by-products (IBPs), liming agents