An experimental study on the nitrate removal ability of aggregates used in pervious concrete

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ABSTRACT

In this research, different aggregates used in pervious concrete, namely zeolite, perlite, and pumice were compared in terms of their ability to remove nitrate from water. Also, several other properties of aggregates were evaluated. Regarding water absorption, pumice and perlite aggregates had the lowest (about 10%) and the highest (40%) absorption, respectively. The results showed no reactivity of aggregates in terms of alkali-silica reaction. Permeability tests indicated that the maximum (1.64 cm/s) and the minimum (1.4 cm/s) permeability corresponded to pumice and perlite aggregates, respectively. The required time for reaching equilibrium concentration in the nitrate removal test was 30 min when perlite and pumice were used, while it was 60 min for zeolite. Moreover, when HCl and H₂SO₄ were applied as an activating agent, this time did not decrease significantly for all aggregates. For all three raw aggregates, nitrate absorption process followed Langmuir isotherm and the absorption capacity was about 70 mmol/g. Overall, pumice was selected as the best raw aggregate among other aggregates tested in this study due to its lower water absorption, having no alkali-silica reactivity, highest permeability, and highest nitrate removal ability based on the presence of metal ions.

Keywords: Nitrate removal; Pervious concrete; Pumice; Perlite; Zeolite

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