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Pore structure alteration of sands by microbially induced carbonate precipitation via denitrification

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Denitrification is one of the key microbial reactions for sandy soils to induce desaturation and calcium carbonate precipitation. As the replacement of urea hydrolysis for microbially induced carbonate precipitation (MICP), the effect by denitrification has been evaluated. Calcium carbonate precipitation and biomass production occur in soil through the reaction process and some of these accumulate in the pore space or on the surface of the soil particles. Due to the accumulation, reducing the porosity, permeability of the soil possibly reduces. Well understanding of pore structure alteration through the reaction makes possible to control permeability efficiently.
This study evaluated pore diameter distributions of three sand samples before and after MICP treatment via denitrification by air intrusion method. By measuring air flow rate applying controlled air pressure into water saturated specimens of the sands, air permeability and pore diameter were calculated. Comparing non-treatment sands, the higher air pressure was required to push pore water against capillary pressure out of pore throats of sands after the treatment. The pore diameter distribution curves were slightly shifted to the smaller pore size range after the treatment. These results indicate that pore water retention ability of the samples was altered by the treatment.

References

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