Resource Recycling of Shield Tunnel Waste Soils Improved by Industrial Waste Phosphogypsum

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Currently, massive shield muck generated from urban metro construction is being transported outside and dumped regarding its undesirable engineering properties. Meanwhile, large amounts of industrial wastes (e.g. phosphogypsum) are being landfilled, which not only occupy valuable land sources, but also pose a threat to the surrounding environment. This project proposed a novel method to use phosphogypsum to improve waste shield muck and convert them into subgrade filling materials. The water content tests, unconfined compressive strength (UCS) tests, scanning electron microscope (SEM) tests, and leaching test were conducted. Results show that the UCS of waste soils improved with traditional cement and lime reached 400 kPa after 7 days curing, and it exceeded 570 kPa with addition of phosphogypsum, which satisfied the strength requirement of the roadbed. The phosphogypsum was demonstrated effective in improving the strength of waste soils through SEM images. In addition, the leaching test results indicate that the heavy metal content leached from the solidified soils was very low after 28 days curing, which fully met the environmental safety standards. The project provided a new solution for resource recovery of shield tunnel waste soils and industrial waste (phosphogypsum), which contributed to low-carbon and environmentally-friendly development.

Awards Won:
Fourth Award of $500