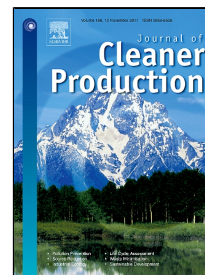


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Utilization of low-grade pyrite cinder for synthesis of microwave heating ceramics and their microwave deicing performance in dense-graded asphalt mixtures

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Abstract

Recycling of large stockpile of low-grade pyrite cinder, a solid waste consisting of hematite and halloysite from sulfuric acid manufacturing plants, will avoid increased stress on the environmental impact because of its difficulty for disposal. In this paper, the most appropriate experimental conditions of preparing microwave heating ceramics (MHCs) from low-grade pyrite cinder was investigated. Moreover, the potential use of MHCs as an aggregate of dense-graded asphalt mixtures with deicing capacity was also demonstrated in laboratory in light of low deicing efficiency of commonly used deicing methods. The results showed that under the following parameters, molding pressure 50 MPa, sintering temperature 1350°C for 180 min, calcium fluoride 5% and coal powder to LPC ratio of 0.1, the microwave heating efficiency (*MHE*) of ceramics was approximately 24.0 times that of limestone and compressive strength of ceramics can reach up to 87.5 MPa. Microscopy analysis revealed that the principal strength-given mineral components in ceramic samples were plate-like mullite and bulk ferric oxides. The *MHE* of dense-graded asphalt specimens containing limestone aggregates totally replaced by MHCs, was 15.0 times that of specimens with no MHCs. The microwave deicing time (*MDT*) of dense-graded asphalt mixtures could be evidently shortened with the increasing of MHCs and increased with the thickness of ice. However, the *MDT* of specimens increased with the fall of surrounding temperature.

Keywords: Low-grade pyrite cinder; microwave heating ceramics; dense-graded asphalt mixtures; deicing capacity

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