

Study of Ladle Furnace Slag as Mineral Filler in Asphalt Concrete with Electric Arc Furnace Slag

Authors : W. J. Wang, D. F. Lin, L. Y. Chen, K. Y. Liu

Abstract : In this study, the ladle furnace slag was used as a mineral filler in asphalt concrete with electric arc furnace slag (EAF asphalt concrete) to investigate the effect on the engineering and thermal properties of asphalt cement mastics and EAF asphalt concrete, the lime was used as a comparison for mineral filler, and the usage percentage of mineral filler was set at 2%, 4%, 6%, and 8%. First of all, the engineering properties of the ladle furnace slag and lime were compared, and then the mineral filler was mixed with bitumen to form the asphalt cement mastics in order to analyze the influence of the ladle furnace slag on the properties of asphalt cement mastics, and lastly, the mineral filler was used in the EAF asphalt concrete to analyze its feasibility of using ladle furnace slag as a mineral filler. The study result shows that the ladle furnace slag and the lime have no obvious difference in their physical properties, and from the energy dispersive spectrometer (EDS) test results, we know that the lime and the ladle furnace slag have similar elemental composition, but the Ca found in the ladle furnace slag belongs to CaO, and the lime belongs to CaCO₃, therefore the ladle furnace slag has the property of expansion. According to the test results, the viscosity of asphalt cement mastics will increase with the increase in the use of mineral filler. Since the ladle furnace slag has more CaO content, the viscosity of the asphalt cement mastics with ladle furnace slag will increase more than using lime as mineral filler in the asphalt cement mastics, and the use of ladle furnace slag only needs to be 2% in order to achieve the effect of anti-peeling which is 6% for lime. From the related test results of EAF asphalt concrete, it is known that the maximum stability value can be obtained when the use of mineral filler is about 5%. When the ladle furnace slag is used as the mineral filler, it can improve the stiffness, indirect tension strength, spalling resistance, and thermal insulation of EAF asphalt concrete, which also indicates that using the ladle furnace slag as the mineral filler of bitumen can help to improve the durability of the asphalt pavement.

Keywords : ladle furnace slag, mineral filler, asphalt cement mastics, EAF asphalt concrete

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