

Shear resistance of rubber-ballast composites in simulated water and acid soaked conditions

Siti Farhanah SM Johan, author

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Abstrak

Ballast is one of the main structures for the railway tracks. It can resist the lateral movement under dynamic loading transferred by the passing trains with repeatedly. Under some circumstances, ballast can suffer degradation or breakdown due to the repeated loading and maintenance. Ballast is easily exposed to the weather because it is laid on the track. Acid rain affects the performance of the railway track near the industrial and urban area. As a result, it starts to foul and the small chips from ballast filled the void, as well as reduce the shear strength of ballast particles. This situation can contribute into the increasing of maintenance frequency and costing. This paper examines the potential of rubber inclusions in increasing the shear resistance of rubber-ballast composites in simulated water and acid soaked conditions with several configuration. This lab-based exploratory work is only static load simulation in conventional shear box setup measuring 60 mm × 60 mm.

The aggregates size is 10 times smaller than actual size of ballast. In order to identify the shear resistance deterioration of rubber-aggregates mixture under poor drainage conditions by soaked a batch of aggregates in water and acid solution for 2 weeks to simulate accelerated weathering effects. The shear resistance did not rise dramatically with the rubber reinforcement. This susceptible shear strain plots indicate ductile behaviour on the aggregates-rubber composites. This is evident by the linear rise of shear stress with strain up to approximately 10% for the control samples (CS) until it reaches a constant value. Note that all the specimens including CS are in a loose state during the testing because there were no tamping been applied on the samples. Overall the circular patch (CP) specimen was the most favourable than the other configurations. Both mechanisms contributed to the reduced overall subsistence, accompanied by an increase in the shear resistance. The inclusion of rubber elements apparently prevented the dilation of the granular material when approaching the shear failure and the reducing the settlement.