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

Siti Farhanah SM Johan, author

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.