

Adhesion properties of asphalts and aggregates in Tropical Climates

INTRODUCTION

- Moisture damage is one of the most common distresses of pavements in tropical climates.
- Moisture reaches the binder-aggregate interface causing loss of adhesion and cohesion, which translates into stripping of binder.
- By quantifying adhesion and cohesion it is possible to estimate the moisture damage resistance of materials commonly used in tropical climates.
- 1) To quantify the adhesion between three asphalt sources available in Colombia and Costa Rica with different aggregate types typically used in HMA construction in the region.
- 2) To characterize the effect of antistrip additives on moisture damage susceptibility.

MATERIALS

Different Binder-Aggregate pairs composed by combining materials from Costa Rica and Colombia as representatives of the tropical region. The binders were modified with hydrated lime and liquid antistrip (LA) as antistrips on the binder.

METHODOLOGY AND RESULTS

Mechanical approach

ABS Test

- Mechanical measurement of the adhesion between binder and aggregate.
- Pull off tensile strength (POTS) of dry conditioned and wet conditioned samples.
- Estimation of the Loss of adhesion by means of [(POTSDry–POTSWet) / POTSDry] x100





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Physicochemical approach

Surface Free Energy (SFE) Measurement

- Estimation of physicochemical properties of materials which define moisture damage performance.
- Calculation of adhesion between binder and aggregate, cohesion of binder and tendency of binder to debond in the presence of water.







Contact angle measurements

Estimation of the wettability of binder and its compatibility with the aggregate surface.



Conclusions:

- differences in the nature of the tests.
- resistance of some combinations.



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The mechanical and physicochemical results of are not necessarily consistent due to

The addition of antistrips changes the mechanical and physicochemical responses of the combinations regarding moisture damage.

The use of antistrips enhances the adhesion of binder with aggregate and the moisture

The results obtained can be used as an important criteria for selecting the appropriate binder, antistrip and aggregate on a moisture-resistant pavement.