

**Project Number**

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Florida Department of Transportation Research**Application of Imaging Techniques to Evaluate Polishing Characteristics of Aggregates**

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Current Situation

The Florida Department of Transportation is continuously searching for better ways to evaluate the aggregate properties that contribute to the required performance and durability needed for frictional resistance. Higher friction increases safety because it reduces skidding and shortens the time required for a vehicle to come to a stop. New types or new sources of aggregates must be qualified for use in Florida asphalt mixtures. Then, the question is how to simulate the years of wear that aggregates are expected to endure and the extent to which they keep their frictional properties. That is where accelerated testing comes in. In addition to seeking new formulas, researchers must also develop accelerated methods and verify that they accurately represent long-term exposure.

Research Objectives

University of Florida researchers developed a modification of their Aggregate Image Measurement System (AIMS) that effectively screens aggregates for use in asphalt friction surface mixtures.

Project Activities

The goal of AIMS is to return the texture index (TI), a measure of surface roughness, of an aggregate before and after various periods of polishing, in this case, with the Micro-Deval apparatus. High TI values indicate more roughness and better friction. Previous efforts to screen aggregates with AIMS had shown that color variation of aggregates interfered with texture analysis, severely reducing the reliability of AIMS for interpreting aggregate durability. To address this deficit, the researchers developed a technique called Photometric Stereo-Independent Component Analysis (PS-ICA), a method that utilizes the existing AIMS hardware, but with new software that effectively separates texture from color variation.

The PS-ICA method that the researchers developed to enhance the reliability of AIMS uses a photometric stereo technique, in which images are taken from the same view under different orders of the two light sources. Previous work by the researchers had demonstrated that AIMS was ideally suited to this type of stereo imaging. Then, an appropriate method of texture analysis was selected, and this information was processed to produce a revised TI.

In developing the method, the researchers found that the specularity, which is the randomly oriented reflections from shiny surfaces in the aggregate, interfered with the texture analysis, artificially increasing the TI. Specularity is not a problem for limestone aggregate, but for others, such as granite, which have mineral components with reflective surfaces, this problem had to be resolved – doubly so, because polishing increased specularity. Several attempts to overcome specularity led to a modified light intensity approach that mitigated the effect, though not entirely. With the techniques and protocols developed in the project, the PS-ICA method will prove to be effective for screening aggregates for friction.

Project Benefits

Improved methods for aggregate screening help to ensure the safety, durability, safety, and economy of Florida road surfaces.

For more information, please see www.fdot.gov/research/.



Granite aggregate is often used in asphalt mixes, but it must meet durability requirements.