Florida Department of Transportation Research

Use of Aggregate Imaging Measurement System (AIMS) to Evaluate Aggregate Polishing in Friction Surfaces
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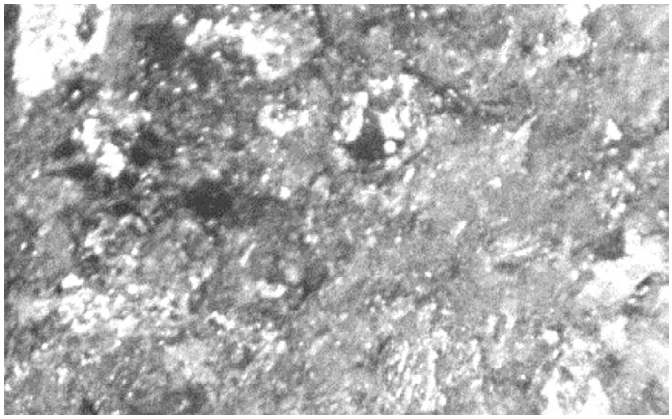
Key to safe driving is the traction between vehicle tires and the road surface, which prevents skidding and loss of control, especially under wet conditions. Pavement friction and skid resistance rely on almost two dozen factors; correlating all these factors to predict skid resistance under arbitrary conditions has proven impossible. Reliable characterization of skid resistance of pavements remains an open area for study. One focus for research has been textural analyses of pavements and, specifically, aggregates, which make an important contribution to skid resistance through frictional forces.

Frictional forces are created at the tire/road interface at two scales. At the larger scale, tire treads and rubber's deformability interact with the macrotexture of asphalt pavement, a property heavily influenced by the shape and size of aggregate particles. At a much smaller scale, aggregate microtexture interacts on a physical and chemical basis with tire material to add an important frictional component. Over time, traffic reduces pavement friction by polishing, affecting some aggregates more than others. Road designers desire a reliable characterization of both macrotexture and microtexture of aggregates, how these properties influence frictional forces, and how long aggregates will provide adequate skid resistance in use.

In this project, University of Florida researchers examined the ability of the Aggregate Image Measurement System (AIMS; Pine Instrument Co., Grove City, Penn.) to evaluate aggregates used in roadway construction. In addition to analyzing fresh aggregate samples, the researchers cored roadways and analyzed aggregates that had been in service for years, a unique feature of this project. Nine aggregates in three categories were studied: oolitic limestone, granitic, and siliceous wackestone. With the help of the Florida Department of Transportation (FDOT) State Materials Office, ten open-graded road sections with a range of aggregates and good skid resistance records were selected for coring.



AIMS incorrectly interpreted the high color variation of this aggregate sample as a high texture index.

AIMS testing was conducted on all virgin aggregate types, unpolished and polished. Aggregates were polished for 50, 105, and 180 minutes with the Micro-Deval apparatus. The researchers then evaluated the microtexture and macrotexture of core surfaces using a surface scanning feature available in AIMS. Individual aggregate particles were removed from the surface layer and evaluated using AIMS.

The researchers used these data, along with years of field friction numbers extracted from the FDOT database, to determine the influence of aggregate properties on pavement friction performance in the field. Results indicated that texture index, as measured by AIMS, is highly affected by color variation and cannot be used reliably to evaluate aggregate surface texture. Furthermore, AIMS can measure texture in only a few length scales, which restricts the amount of possible information which can be collected from aggregate surfaces. The researchers found no statistically significant relationship between pavement friction performance and texture measurement using AIMS on virgin aggregates and field cores.

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For more information, visit http://www.dot.state.fl.us/research-center