

# CALIFORNIA STATE UNIVERSITY LONG BEACH

# Novel Eco-friendly, Recycled Composites for Improved California Road Surfaces

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The continued use of structural plastics in consumer products, industry, and transportation represents a potential source for durable, long lasting, and recyclable roadways. Costs to dispose of reinforced plastics is similar to procuring new asphalt with mechanical performance exceeding that of the traditional road surface. Our specific aims are to examine novel eco-friendly recycled plastic composites as a viable solution for improved California road surfaces.

## **Study Methods**

This investigation uses material testing standards and developed an additional test procedure to examine several material samples of interest including asphalt, both new and recycled composites, and plastics. Performance was measured under the various loads but more importantly, the tests were carefully selected to provide the necessary information for input into an advanced computer simulation software which was custom programmed for evaluating these materials in more realistic loading environments. This will allow us in the future to go directly to the computer model to check the strength, longevity, or performance of new road surfaces without requiring extensive physical testing.

## Findings

Composites have very high strength in tension and good wear resistance, even when they have been processed during recycling. They can easily outperform asphalt and survive much longer without servicing leading to longer lasting roads, and their relatively low cost after their primary usage in aerospace applications mean they can be recycled and removed from landfills.

### **Policy/Practice Recommendations**

New, improved methods for validation testing should be investigated.

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Figure 1. Abaqus simulations of tensile crack and accelerated surface wear tests on asphalt.

A composite road under normal operating conditions would never need replacement whereas asphalt is known to have a finite lifespan.

#### About the Authors

Daniel Whisler is an Assistant Professor in the Department of Mechanical and Aerospace Engineering at California State University, Long Beach, specializing in advanced material characterization, novel test methodologies, and finite element validation. Rafael Gomez Consarnau is a recent M.S. graduate in aerospace engineering from CSU Long Beach. Ryan Coy is a current undergraduate student at CSU Long Beach.

#### To Learn More

For more details about the study, download the full report at transweb.sjsu.edu/research/2046



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