

## SUSTAINABLE USE OF CELLULOSE FIBERS DERIVED FROM INDUSTRIAL WASTE TO IMPROVE THE MECHANICAL BEHAVIOR OF ASPHALT MIXTURES

Laura Yessenia Cabello-Suárez<sup>1</sup>, Pedro Limón-Covarrubias<sup>1</sup>, José Roberto Galaviz-González<sup>1</sup>, Manuel Alberto Gallardo-Sánchez<sup>1</sup>, Gabriel Landázuri Gómez<sup>2</sup>, José Anzaldo Hernández<sup>3</sup>, Emma Rebeca Macias Balleza<sup>2</sup>

<sup>1</sup>Universidad de Guadalajara, Ingeniería Civil y Topografía, Mexico. <sup>2</sup>Universidad de Guadalajara, Ingeniería Química, Mexico. <sup>3</sup>Universidad de Guadalajara, Madera Celulosa y Papel, Mexico.

Asphalt regarded as a thermosetting polymer also known as bitumen, is a material used as a binder in asphalt mixtures together with mineral aggregates such as sand and gravel. Currently, new asphalt mixtures incorporating natural and recycled fibers are being developed to enhance mechanical performance and reduce environmental impact. Among these, cellulose pulps derived from industrial waste such as agave bagasse from the tequila industry and recycled cardboard (OCC) stand out. This study evaluates the effect of these fibers in Stone Mastic Asphalt (SMA) mixtures, comparing them with a commercial cellulose (CF315 SMA). The agave pulp was obtained through alkaline cooking followed by a five-stage bleaching process, with samples separated after three (3B) and five (5B) bleaching stages. The cardboard pulp was obtained mechanically. Results showed that the 3B and 5B agave pulps improved resistance to permanent deformation and wear of the mixture, helping to reduce cracking under load and environmental conditions. In contrast, the cardboard pulp promoted crack propagation. The higher crystallinity and lower lignin content of the agave fibers enhanced compatibility with the asphalt mixture, increasing its stiffness and load-bearing capacity. In conclusion, agave derived fibers represent a sustainable and effective alternative to commercial additives, contributing to the circular economy and improving the performance of SMA asphalt mixtures.

**Keywords:** Cellulose fibers, SMA asphalt mixtures, Mechanical performance

**Presenting author's email:** [cabello.lauray@gmail.com](mailto:cabello.lauray@gmail.com)